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IRON AND COAL
TRADES REVIEW

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Spring Thoughts on Coal

AT Hobart House, where the overall responsibility for the coal industry rests (somewhat heavily), the coming of spring is unlikely to be greeted with the same unalloyed pleasure that this season of the year brings to most of us. The joy with which Sir James Bowman and his colleagues on the National Coal Board welcome the precocious crocus and the first nodding daffodil must be restrained by the knowledge that the spring months bring a decline in the demand for coal for space-heating purposes and, traditionally, the beginning of an upward movement in stock figures. Nevertheless, it is possible to draw some measure of cheer from the latest coal statistics of the Ministry of Power.

Overall, inland coal consumption is down compared with the comparable period of last year, the totals for the first 10 weeks being 45,068,000 tons in 1960 and 45,176,000 in 1959. This is not a big difference, and, in fact, is more than accounted for by the decline of 208,000 tons, from 9,325,000 tons to 9,117,000 tons, in domestic consumption over the period. It follows that public-utility and industrial consumption has been better maintained, and it is in these sectors that the promise of the future is primarily to be found.

Coal consumption by the electricity industry has risen from 10,872,000 to 11,421,000 tons in the 10 weeks. Undoubtedly some of this is due to a greater use of electricity for space heating, which has to some extent been at the expense of domestic coal sales, and as the weather becomes warmer the home heating load on the power stations will lighten; but the call for power in other directions is increasing steadily and the coal industry can look for a continuous growth in the call for coal by the electricity undertakings in the years ahead, at least until such time as nuclear power takes a greater part in satisfying the load. Oil for electricity generation is not now the headache to the NCB that it was a year or so ago, and it is evident that nuclear stations will not take over from conventional units to the extent and in the time once forecast by the prophets.

The gas industry and the railways have taken less coal this year, and the prospects of their taking more are doubtful in the former instance and virtually nil in the latter. Coke ovens, however, have stepped up their consumption of coal, from 4,994,000 tons in the first 10 months of 1959 to 5,470,000 tons this year. This is a cheering sign and a pleasing confirmation of the recovery in the iron and steel industry, which has in itself raised its consumption during the period from 828,000 to 845,000 tons. New records of steel production are expected this year, and although a large part of the production is based on oil, the expansion in steel nevertheless augurs well for coal. In its use of oil the steel-producing industry cannot be accused of disloyalty to coal, for many of the conversions in recent years were made at the request of the Government, with the NCB acquiescing, because it was believed that the coal shortage had become chronic. Another good sign is that coal consumption by the engineering and other metal trades is up, compensating in some measure for the fall from 5,496,000 to 5,276,000 tons in the 10 weeks in the amount of coal taken by users coming under the heading, "other industries." It is in these "other" industries that the NCB must look for results from the energetic drive it is making through its technical sales service and by extensive advertising to recover ground lost to oil.

How close we are still to the change in the coal trade from a scarcity to a plenitude of supplies is demonstrated by the fact that imports still figured (to the tune of 94,200 tons) in the Ministry's statistics for the first 10 weeks of 1959. Imports ceased in March of that year. In the outward direction, exporters' efforts have succeeded in stepping up shipments abroad from 639,000 tons in the 10 weeks of 1959 to 1,020,000 tons this year. The increase is encouraging, although it is too early yet to judge just what measure of success we are achieving in the export markets, which present many difficulties and not a few imponderables in gauging prospects.

Because overall the National Coal Board's disposals so far this year are slightly up compared with 1959, while output is down (total production in the 11 weeks ended March 19 was 44,988,100 tons, against 47,837,600 tons), undistributed stocks have been reduced since the beginning of 1960, but they still amounted to 32,719,000 tons on March 12, compared with 20,314,000 tons a year earlier. The NCB cannot look with equanimity at a stock figure as high as this, but it will not be easy to get the figure down without reducing output further. There is room for gratification at a reduction from 14,164,000 tons to 12,312,000 tons in distributed stocks, but it is conditioned by the knowledge that industrial and public-utility consumers as a whole

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have taken some of the financial burden of stockpiling off their own shoulders and placed it on the backs of the producers.

Productivity is still on the increase. Output per manshift in each week of 1960 has been above the level in corresponding weeks of 1959. Taking the average over the first 10 weeks, overall o.m.s. was 1.396 tons, compared with 1.361 tons last year, while o.m.s. at the face was 3.922, against 3.725 tons. In the week ended March 19, this year, the rates were 1.419 tons overall and 3.995 tons at the face, which represents a commendable advance on last year.

While the coal industry statistically is not everything it would like to be, here is abundant evidence that it is moving steadily towards a stronger and more economic position, along the lines laid down in the revised plan. It is demonstrating its awareness of the fact that coal is no longer a seller's market in no uncertain way. Its drive to fight back against oil in the industrial market is making itself felt, and its latest effort on the domestic side, to stimulate interest in central heating by solid fuel, holds real possibilities of increased sales. The NCB is determined to impress on the public that coal is not "a back number"; that, on the contrary, properly used in the right appliances, it is as modern as any competing fuel, and generally a good deal cheaper.

Sharp Fall in Unemployment

GLOOMY forebodings of increasing unemployment have not been fulfilled. Employment in the UK is now at an all-time peak and between mid-February and mid-March the numbers of registered unemployed fell by 37,000 to 413,000, or 1.9 per cent. While some fall in unemployment in March is normal on seasonal grounds the improvement this year is about twice the post-war seasonal average.

The most encouraging feature has been that improvement has been concentrated in those areas where unemployment is heaviest—Scotland, Wales, and the north-east. In Scotland the percentage has dropped from 4.7 to 4.3 per cent., in Wales from 3.3 to 3.0 per cent., and in the north-east from 3.5 to 3.3 per cent.

Labour shortage in the Midlands is reaching the acute stage. The average unemployment rate of 0.9 per cent. is the lowest for four years and also the lowest in the country. The greatest demand is for draughtsmen, tool-room operatives, and other skilled grades.

HIGHEST OUTPUT of ferrous metals and ferrous metal products since the end of the war was recorded in Japan last year. Japan has now become the fifth biggest iron and steel producer in the world. Output in metric tons, compared with 1958 levels (given in parentheses), was as follows:—Pig-iron, 9,445,054 (7,393,783) or 27.9 per cent. output increase; raw steel, 16,615,009 (12,117,991) 37.1 per cent.; ordinary rolled steel qualities, 11,637,752 (8,763,773) 32.8 per cent., and special rolled steel grades, 826,588 (507,076) 63 per cent.

Passing Thoughts . . .

I CAN only remark that distance lends enchantment when I read that before nationalization there was "clean coal 100 per cent. combustible" with no causes for complaint. I worked in the pre-war years in the biggest coal-selling organization in Great Britain and I have the clearest recollection of exactly the kind of criticisms of the coal supplied as Mr. Osborne now restricts to nationalized coal. After all nationalization did not alter the nature of the coal in the seams.—SIR JOSEPH LATHAM, deputy chairman of the National Coal Board, replying to a letter by Mr. Osborne in the Birmingham Post.

> *No complaints are made about electric fires, and no questions asked in the House about gas heaters. The coal fire, which spits slate and burns carpets and children at a very high annual rate is ignored. Surely the Government does not have to resort to this stupid campaign in order to solve its coal problem. We have heard the miners crying about fuel oil. The Government is doing the same.—Letter in the Daily Telegraph.*

To complain because the nationalized industries raise their prices, or get still less efficient, or add to the vast sums to be found by the taxpayer—this is no longer enough. The manufacturer must face the fact that these industries, or some at least of them, are simply not capable of improvement in anything like their present form. They must be given up, and what is substituted for them may well have to be something startlingly, and perhaps painfully, different if it is not to display the old faults.—British Manufacturer, journal of the National Union of Manufacturers.

> *I have no love of publicity. Probably the number and extent of newspaper reports on my parliamentary activities, coupled with my TV and radio programmes, is due to the fact that my approach to current domestic problems is deemed highly individualistic.*—MR. GERALD NABARRO, *Conservative MP for Kidderminster, in the News Chronicle.*

When you come to a full realization that your ability to learn can be outstripped by a machine; when you work with an electronic memory more capacious for detail and more assured in recall than your own; when you see a small machine exhibiting a more-than-human determination to find a way to its goal; and above all when you see how easily the whole lot goes wrong, then it becomes much easier to get yourself in perspective—if you really want to.—MR. STAFFORD BEER, head of the operational research and cybernetics department of the United Steel Companies, Limited, in his second broadcast in the Home Service.

> *The apprentice I came to this conference with last year has now left engineering. He got fed up with his wages. He became a bookie. Now he's doing very well.*—KEITH NEWNHAM, *an apprentice at the AEU youth conference.*

OVER 40 COUNTRIES will be represented at the official opening by Mr. Reginald Maudling, President of the Board of Trade, of the ninth Electrical Engineers Exhibition at Earls Court, London, on April 5. This year's event will see the largest display of electrical engineering products ever staged in this country and the total value of exhibits is estimated to be about £3,000,000. Over 450 manufacturers have taken space at the exhibition.

SMALL MINE OWNERS PROTEST

NCB's Terms Mean Threat to Livelihood

STRONG protest at the National Coal Board's attitude to the owners of small private mines has been registered by the South Wales and Monmouthshire Small Mines Association, which represents some 200 private mines employing 2,300 men in the South Wales coalfield. Output is to be cut from 704,122 tons last year to 500,000 tons this year and 375,000 tons in following years. Royalties are being increased from the present level of 9d. and 1s. to 4s., 5s., and 6s., according to the seam being worked.

In a memorandum the association, pointing out that when it suited the NCB it encouraged licensees to produce more and more coal, asks: "Why, then, does this great monopoly at this time use its powers to bludgeon out of existence this small but enterprising section of the industry? Would the State permit such action being taken by the large industrial concerns against the small but successful trader?"

Maintaining that the small mines are owned and managed in the main by miners with "ambition, courage, and a desire to get on," the association states that it is convinced that the performance of the small mines has earned them a right to a place in the industry.

"Crippling" Royalty Demand

Total coal output from licensed mines in the South-Western Division since 1947 was approximately 5,000,000 tons, of which over 1,000,000 tons were exported to the Continent, not only assisting Britain to retain a foothold in the export market, but also earning over £5,000,000 in foreign currency. In the past licensees were encouraged by the board to spend considerable sums in capital expenditure to attain greater efficiency and output in the belief that the greater need for coal would continue. Many development schemes are only now reaching fruition, the association states.

The memorandum criticizes the board's "crippling" royalty demand, and its refusal to make a concession, and says that the members of the association are prepared to accept the NCB's proposal for opening a security fund with each licensee depositing £100 for each opening, and £10 per acre of take. Its leaders feel that if the terms of renewal are not changed some 150 mine owners in South Wales will renew their licences, but will have to close in time because of mounting losses.

"As far as the Coal Board is concerned it is a case of take it or leave it. Someone should arbitrate on this question," said Mr. T. T. Lewis (Neath), the association chairman. "Its action indicates that it is NCB policy to get rid of us."

To safeguard their position and to give their workers an opportunity to look round for other jobs some of the owners have already given notice to their men. It is understood that 1,200 are affected. Mr. Albert Walsh, deputy chairman of the South-Western Divisional Coal Board, said on Tuesday that he thought many of them would be able to find work in NCB pits which were short of men. "There are vacancies in many parts of the coalfield and we can take all the fit men we can get," he said.

Mr. Rupert Speir, Conservative MP for Hexham (Northumberland), has intimated that he intends to raise the matter in the House of Commons.

Rhymney Valley Collieries Development

DETAILS of the £12,500,000 development scheme for collieries in the No. 5 (Rhymney) Area of the South-Western Divisional Coal Board were given by the divisional secretary, Mr. E. A. Lewis, speaking at Caerphilly Rotary Club this week. The five collieries affected are Ogilvie, Bedwas, Penallta, Nine Mile Point, and Risca.

Mr. Lewis said that at Ogilvie, work has been going on for nearly seven years on a vast project involving the absorption of McLaren Colliery. At Bedwas extensive underground developments are planned and the surface will be completely reorganized on the most modern lines. Apart from these key pits others in the valley will be geared up to produce more coal.

These plans made it clear that the South Wales coalfield had a bright future. The biggest problem facing the board was shortage of manpower, and there were now 204 vacancies in collieries in the Rhymney Valley area alone. By the end of March there would be 450, of which 112 would be created by miners reaching retiring age. By the end of the year the number of vacancies would have jumped to 950.

"It is vital that the coal industry should have the manpower to produce the coal the country needs for making its steel, for supplying its electricity, and improving the balance of payments by an expansion of the coal export trade," said Mr. Lewis.

Sharpeville Shooting: Miners Urge One-day Protest Strike

SOUTH Wales executive of the National Union of Mineworkers on Tuesday proposed a day of mourning and a one-day protest strike against the shooting of Africans at Sharpeville, Transvaal, the previous day. Area president Mr. Will Whitehead commented: "We are shocked. We think that the position is of such gravity that we should ask working people throughout the country to stop work for a day."

A resolution was passed asking the union's executive, the TUC, and the Labour party to call a conference of all workers to express their indignation at the policies of the South African Government.

Yorkshire Coalfield Needs 8,000 Men

NEARLY 100 miners have already put their names on a waiting list for jobs at the first new pit in the Yorkshire coalfield since before the war—Kellingley Colliery, near Knottingley. They are the vanguard of a movement from old collieries in the Wakefield and Normanton districts which will be approaching the "worked-out" stage over the next decade or so.

At Kellingley on Thursday of last week, Mr. Dean Harrison, general manager of No. 8 (Castleford) Area of the North-Eastern Divisional Coal Board, said that the first pit to end its economic life would be West Riding Colliery, Altofts (1,200 men), which at the present rate would be worked out in five to seven years. The Fox Pit drift mine nearby had a longer life. A year or two later West Riding's neighbour, Newmarket Silkstone, would begin to transfer some of its 1,000 miners.

Following these—although the move might be spread over a period of up to 20 years—were Water Haigh (1,200), Glass Houghton (2,100), Whitwood (1,700), and Primrose Hill (1,000).

Eventually Kellingley will employ 3,000 men and by 1965 it should reach a daily output of 6,150 tons. More than 200,000,000 tons of coal are expected to give the pit a life of 130 years, and much of the coal—worked from seven seams—is good quality coking coal.

For at least the first 10 years of its life Kellingley will not discharge its waste on to spoilheaps, but into nearby quarries. There will be plenty of parking space at the colliery for miners' cars and the NCB is to build 500 houses close at hand for key workers.

The colliery's two 1,000-ton winding towers stand at heights of 170 ft. and 140 ft. on ground which for a diameter of 80 ft. and a depth of 640 ft. has been frozen solid. Huge refrigerating units are used to freeze the water-bearing strata as the shafts cut through them. When the shafts are lined the ground will be thawed out and fissures filled with concrete grouting.

Kellingley is part of the planned forward drive in the North-Eastern Division. This week the two-year labour freeze has ended with the start of a recruiting campaign throughout the coalfield. More than 8,000 new workers are required in the No. 1 (Worksop) and No. 2 (Doncaster) Areas.

A Coal Board spokesman said that between now and the end of the year the board wanted to recruit about 8,000 adults and juveniles in the division. Provisionally they wanted about 4,000 juveniles (under 18) and assuming these were forthcoming the requirement for people over 18 in the Doncaster Area was about 3,000, with a further 1,100 for Worksop. If the juvenile requirement was not fulfilled the board would have to make up the number if it could by taking on more adult workers.

Anyone under 18 would receive first-class training for whatever job their aptitude fitted them for and there was no reason why they could not rise to the top of the industry. When the recruits were trained the division should be able to fulfil the increased production target given in the Revised Plan for Coal.

Since it had become compulsory for miners of 65 to retire, some of the 8,000 would be needed to replace the increased normal wastage. Undermanned collieries in the Doncaster Area were:—Bentley, Brodsworth, Bullcroft, Hatfield, Hickleton, Markham Main, Rossington, and Yorkshire Main (Edlington): the Worksop Area pits are:—Dinnington, Firbeck, Maltby, Kiveton Park, Orgreave, Thurcroft, and Treton.

"Free Rein" Urged for Pit Engineers

ENGINEERS must be freed from centralization—the scourge of modern large-scale industry—in order to play their part in ensuring the economic success of the coal-mining industry, said Mr. Ernest Loynes, president of the Association of Mining Electrical and Mechanical Engineers, at Cardiff on Saturday. They must also be given a measure of authority commensurate with the onerous responsibility placed on them statutorily and in other ways, he said at the annual dinner of the 600-strong South Wales branch of the association.

"Let us have an abundance of ideas and plenty of scope and a free rein to implement them," he said. "When everyone thinks alike, few are doing much thinking." Mr. Loynes reminded members that this was the association's jubilee year and that a broad outline of policy had been adopted to ensure achievements in the second half of the century, and to extend the association's work.

A new technical committee had been formed. The training and education of electrical and mechanical technicians was a long process and he was glad branches were encouraging youth by the formation of student and graduate sections.

Mr. A. B. Oldfield-Davies, BBC Controller for Wales, described the new kind of coal industry as being more akin to button pushing than tram pushing. "I do not know how long we have to wait until the accumulated skill of your association will make a white collar job of the coal industry," he said. The future would depend on happy relations among the men and also on the skill and wisdom exercised. That skill depended on a higher and more widespread standard of technical education.

A presentation was made to the former secretary, Mr. R. D. Williams, in recognition of his work for the branch during the past four years.

Tyneside February Coal Shipments Rise

COAL and coke shipments from Newcastle-upon-Tyne last month rose to 546,898 tons, an increase of 12,510 tons on the figure for February last year, it was stated at a meeting last week of the Tyne Improvement Commission. The docks and trade committee reported that the improvement was centred on coastwise cargoes to London, which rose by 27,856 tons to 430,610 tons and which probably reflected a renewed demand for coal from Tyneside following February's wintry weather.

There was, however, a reduction of 2,513 tons to 60,644 tons in coastwise shipments to other ports. Export cargoes dropped by 11,570 tons to 51,190 tons, and there was also a drop of 1,263 tons, to 4,454 tons, in bunker shipments. Despite the total improvement in February, coal shipments for the first two months of the year of 1,074,549 tons were 6,500 tons below the corresponding period of 1959.

Mainly because of increased imports of iron ore, imports of general merchandise into the river in January totalled 239,412 tons, an increase of 119,884 tons. Exports of general goods, however, fell by 9,443 tons to 35,863 tons.

In Parliament

Steel Denationalization

GOVERNMENT HOPE OF "SIGNIFICANT PROGRESS"

HOPE that within the lifetime of the present Parliament the Iron and Steel Holding and Realization Agency will complete its duty of "substantially returning" the steel industry to private enterprise was expressed by MR. ANTHONY BARBER, Economic Secretary to the Treasury, in the debate on the committee stage of the Iron and Steel (Financial Provisions) Bill on Tuesday In spite of considerable criticism from both sides of the House the MINISTER OF POWER, Mr. Richard Wood, stood firmly by the Bill, which empowers loans of up to £70,000,000 to the State-owned Richard Thomas & Baldwins, Limited, and up to £50,000,000 to Colvilles, Limited, the Scottish private enterprise steelmakers.

Delay by the Government in proceeding with denationalization of the industry was attributed by Mr. Barber to the uncertainty caused throughout the industry by Labour's threat to renationalize steel. It had caused difficulty in raising money privately and had meant that the Government had had to leave money on loan in the industry to provide funds for its development which could not be provided elsewhere. So far as production, employment, and sales were concerned, five sixths of the industry was now in private hands.

ISHRA took over securities with a book value of £252,000,000 and outstanding loans of a further £57,000,000. When it discharged obligations inherited from the Iron and Steel Corporation, the total assets to be disposed of amounted to £364,000,000. Securities and investments now held by the agency stood at £213,000,000. That was a reduction in money terms of £151,000,000, or 40 per cent.

No "Watchdog" Needed

That reduction was not the simple process of successive sales. While assets to be disposed of had amounted to £364,000,000, receipts and reduction of obligations amounted to £290,000,000; but ISHRA had to reinvest £139,000,000 in the industry. "The Government is determined to proceed with the process of denationalization until it is complete," he said. It was in no sense a weakening of that determination to point out that the rate of progress in returning steel to the market must inevitably depend on the state of the market and fulfilment of considerations to which by statute the agency must have regard.

It was hoped that significant progress would be made during the course of this year and he criticized the amendment of MR. JOHN CRONIN (Lab.) (to restrict loans to companies that were publicly owned) as making possible, at least, the renationalization of Colvilles. "Such a purpose could hardly be farther from Government policy," he said.

The first amendment was moved by MR. JOHN DIAMOND (Lab.), who wanted the Government to appoint assessors to the boards of companies to which it lent money. The assessor would be a watchdog, he said, and provide a two-way channel of communication between the board and the Government. It would apply particularly to Colvilles; there was already ample opportunity for control over RTB as a publicly-owned company.

The loan to be authorized to Colvilles would give a total of £64,000,000 of public money invested in the company—four times the amount invested by private sources. Surely it was asking terribly little to have an assessor.

Loans to companies, particularly that to Colvilles, were adequately protected by formal legal agreements, the MINISTER replied. He and Parliament also had adequate powers to watch developments that took place connected with the loans.

MR. GERALD NABARRO (Con.) doubted the Minister's confidence in Parliament's power to control loans once made. So long as there was State money vested in any sector of industry, nationalized, denationalized, or privately owned, there should be proper Parliamentary accountability, he maintained.

The amendment was supported by MR. JACK JONES (Lab.), who said he had seen a lot of money spent usefully in the steel industry—and also millions wasted. Mr. Diamond was seeking a watchdog, someone who could sit quietly on his tail, wag it occasionally, show its teeth occasionally, bark if need be, and bite if necessary on behalf of the public.

Also in favour of a Parliamentary "watchdog" were MR. GEORGE LAWSON (Lab.) and MR. FREDERICK LEE (Lab.), who remarked that the agreement with Colvilles was the most advantageous agreement short of a complete dole from the Treasury he had ever seen transacted in the history of Parliament.

Although MR. WOOD again insisted that he had no need of an assessor and again explained that Parliament would have plenty of opportunity to comment, question, and exercise control of the arrangements made under the Bill, criticism was still forthcoming—from MR. NABARRO, MR. GEOFFREY HIRST (Con.), and MR. DIAMOND. The latter maintained that the Minister had gone much too far in saying that he had all the powers that were needed to follow up the payment of the money. There was considerable anxiety on both sides of the House.

An amendment designed to secure for the nation an equitable share of any profits made after the advance of the loans was moved by MR. JOHN MENDELSON (Lab.). The Bill, he said, saw the development of a policy which involved the spending of a great deal of public money at a very low rate of interest so that

advantages would accrue to shareholders in the future through an increasing rate of profit. He was supported by MR. JACK JONES.

MR. JO GRIMOND (Lib.) said the Government should look closely at the rate of interest charged to Colvilles. It should make sure that it was not such that it put Colvilles' competitors at a severe disadvantage or that the shareholders came off much better than the taxpayers. There was a possibility that Richard Thomas & Baldwins might be denationalized and in passing any price the Government should make sure that the investment was taken into account. He was doubtful about the whole procedure in the Bill and hoped it was an exceptional proceeding.

If the amendment were carried, MR. WOOD replied, several problems would have to be faced immediately—agreement on an exact share of the profits which should be distributed and the proportion to be reinvested or put to reserve, the different kinds of rights enjoyed by shareholders and those who held fixed interest securities, and the removal of control from the hands of shareholders and directors.

He was prepared to say what the rate of interest on the loan was. If a *tranche* were issued today the rate of interest would be 5¼ per cent. That had regard to the rate at which the Government at any given period was able to buy. Therefore it was not possible to say what the rate would be in the future.

The Government faced no risk—it was bound to get its money back. But the risk—and there was a risk—was faced by Colvilles. Because the risk happened to have been faced successfully the amendment was on the order paper; but it was rather late to back the horse when it had already passed the post.

MR. JACK JONES's amendment called for the appointment to a borrowing company or companies of a Government director or directors. Colvilles was being given an enormous amount of money for the purpose of putting up a strip mill, he said. Its technicians and directors, good as they were, had not got the know-how of running a modern strip mill and it was in the company's own interest to have a director or directors who had some knowledge of the particular and peculiar form of industry.

MR. WOOD said he could not see that a Government director on the board of such a firm as Colvilles would be able seriously to affect decisions. On the other hand it would be impossible for him to sit at the meetings of the board and refrain from expressing views on such things as future trends of output, wages, and prices, in which it was best in these kind of circumstances that the Government should not be involved. His presence on the board was likely to be more of an embarrassment to the Government than a help, the Minister believed.

Coal Wagon Shortage Problem "Substantially Overcome"

SHORTAGE in supply of empty railway wagons to collieries and open-cast sites early this year has been substantially overcome, said the MINISTER OF TRANSPORT, Mr. Ernest Marples. The British Transport Commission and the National Coal Board met daily at regional level, and weekly at national level—an indication that the two bodies were trying hard to overcome the difficulties.

MR. GEORGE SYLVESTER (Lab.) had asked the Minister if he was aware of the critical situation developing in many coalfields where pits were always on the verge of stopping work because of the shortage. He said that the problem had caused great concern in the Yorkshire coalfields for many weeks. "Members who represent mining areas have had representations not only from the Yorkshire Area of the NUM, but also from the Yorkshire branch of the National Association of Colliery Managers," he said.

MR. MARPLES said this was a matter which ought to be put to the management of the British Transport Commission. He would see that the BTC was given notice of the question. He went on to tell MR. JOHN MORRIS (Lab.), who asked whether everything had been done this winter to shift coal from South Wales and other areas in view of vast accumulating stocks, that the trouble was greater in the Midlands than in Wales.

In a written reply to COL. SIR LEONARD ROPNER (Con.), the Minister said he was aware of recent difficulties in the supply of empty wagons to collieries and open-cast sites, particularly in the West and East Midlands and Yorkshire. "This was not due to any overall shortage of wagons, but to difficulties in the movement of both loaded and empty wagons caused by shortages of staff."

He was not prepared to give a general direction to the British Transport Commission on this matter. "The supply of wagons for general use or for any particular traffic or place is a matter of day-to-day management for which the BTC is responsible," he said.

DIVIDEND INCREASES

RATE of dividend increases has been faster than that of wages, said the CHANCELLOR OF THE EXCHEQUER, Mr. Heathcoat Amory, on Tuesday. He said that wage rates had increased by 42 per cent. from 1952 to January, 1960, and by about 3½ per cent. from 1958 to 1960. Although information on dividends was not yet complete, preliminary figures suggested that dividends paid by companies on ordinary shares in 1959 were 78 per cent. higher than in 1952 and about 12 per cent. higher than in 1958.

He added: "These estimates reflect increases in share capital as well as in rates of interest per share." When MR. DOUGLAS JAY (Lab.) suggested that these were striking figures which showed dividends had been increasing faster than wages throughout the period of Conservative Government, the Chancellor replied: "Between 1938 and 1952 it was entirely the other way round.

During that period dividends only increased by 30 per cent., whereas wages increased by 100 per cent. What has happened since then has only just about restored the balance."

TOO MUCH COKE?

CAPACITY of the coke ovens to be erected by Richard Thomas & Baldwins, Limited, at the Spencer Works, Llanwern, would be 750,000 tons a year and that of the coke ovens associated with the Ravenscraig strip mill of Colvilles, Limited, would be 560,000 tons, the MINISTER OF POWER, Mr. Richard Wood, told MR. EDWIN WAINWRIGHT (Lab.).

There were about 5,000,000 tons of hard coke in stock and the NCB was having great difficulty in selling it, MR. WAINWRIGHT said. Would the Minister consider calling together with his department officials of the NCB and of the two steel companies to try to ascertain whether or not these two by-product plants were essential to the economy?

The Coal Board, the Gas Council and the appropriate area gas boards were very fully consulted about the needs of RTB, MR. WOOD replied. There were some

very good technical and economic reasons, including the long haul, for Colvilles not taking its coke from outside.

FUEL FOR POWER STATIONS

QUESTIONS relating to electrical and nuclear power generating stations were put by MR. FREDERICK LEE (Lab.). MR. RICHARD WOOD, Minister of Power, told him that after consultation with the electricity industry the National Coal Board planned to provide for a coal consumption of 55,000,000 tons in 1965 at power stations in Britain. No estimates of consumption in 1967 and 1970 were available, but the NCB would operate the capacity required to meet demand.

Estimated total output capacity of power plant in operation at the end of the year would rise from 27,130 mW this year to 34,833 mW in 1964. The nuclear proportion next year would be 2 per cent. and this would probably rise to 5.2 per cent. in 1964. Estimated fuel consumption by power stations in coal or coal equivalent was 54,000,000 tons for 1960-61 and 64,000,000 tons in 1964-65. There was no nuclear component for 1960-61, it would be 4,000,000 to 5,000,000 tons of coal equivalent in 1964-65.

COAL STOCKS DETERIORATION

ANY discussion on coal is fairly certain to draw Mr. Gerald Nabarro (Con.) in before it is over. Question Time on Monday was no exception. MR. RICHARD WOOD, Minister of Power, had just told CAPT. DAVID GINSBURG (Lab.) that he based his statement on the loss of calorific value of coal stocked at the pithead on the advice of the National Coal Board and the scientific Advisory Council when MR. NABARRO asked whether he still adhered to his previous view of a 1 per cent. per annum deterioration after a further three months of very large coal stocks.

The 1 per cent. was decline in calorific value and did not represent the whole figure of deterioration, the MINISTER replied.

MR. NABARRO: "What is the total percentum deterioration, as these answers are all becoming very confusing and obscure?"

MR. WOOD suggested that Mr. Nabarro table a question in the next three weeks.

REPLYING TO Mr. Hilary Marquand (Lab.), the Chancellor of the Exchequer said that the Iron and Steel Holding and Realization Agency had made no advances to its wholly owned subsidiary Giers Mills & Company, Limited, pig-iron makers, of Middlesbrough, for the purposes of modernization and plant extension, since July, 1953.

INSTALLATION AND running costs of conventional and nuclear power stations are likely to fall, said the Minister of Power in a written reply to Mr. Roy Mason (Lab.). He added, however, that the trend depended on many factors, including future technical advances. Neither installation nor running costs could be precisely forecast, but there was reason to hope that within 10 years the cost of nuclear power used for base load generation would be equal to the cost of power from coal- or oil-fired stations.

FOURTH BIGGEST STEEL manufacturer in the United States, the Jones & Laughlin Steel Corporation, of Pittsburgh, announces that 1960 production, turnover, and profit, will break all records. To reduce production costs, the company has planned investments of $95,000,000 for this year compared with only $50,000,000 for 1959.

"Shipbuilding Output May Fall Heavily"

POSSIBILITY that shipbuilding production in the United Kingdom would fall heavily in the next five years was referred to by Lord Hailsham at the annual dinner of the Royal Institution of Naval Architects in London on Tuesday. He said that if this was so, the industry's ultimate recovery and its very survival would depend upon its ability to compete with highly efficient foreign yards.

Lord Hailsham asked whether British yards were doing enough to apply new techniques to shipbuilding compared with some of their rivals. He knew of no research on production techniques and methods at present being undertaken in organizations representing the industry, and asked whether satisfactory machinery had been developed for smoothing out conflicts with the traditional views on the allocation of jobs.

Replying, the president, Lord Runciman of Doxford, said a tremendous amount of research was being carried out on ships. He would like to see research devoted not so much to starting ingenuity as to keeping it going; not so much to complicating ships, but to getting the same results in simplified ways.

Earlier, at the institution's annual meeting, Dr. T. W. F. Brown, director of the Parsons & Marine Engineering Turbine Research and Development Association, Wallsend-on-Tyne, said that fuel cells and thermo-electric and electromagnetic methods of power generation might be the first shadows of tomorrow's means of marine propulsion.

Chairman of Shipbuilding Advisory Committee Resigns

SIR GRAHAM CUNNINGHAM has resigned his chairmanship of the Shipbuilding Advisory Committee because of differences between himself and the employer representatives on the committee over his proposal for a sub-committee to inquire into the state of the industry and to make recommendations. In a letter tendering his resignation to Mr. Ernest Marples, Minister of Transport, Sir Graham said the employer representatives insisted on asking for deferment of the proposals. "I consider these excuses so frustrating that to continue serving the industry as independent chairman would be fruitless."

Sir Graham is chairman of Stern & Bell, Limited, steel fabricators, etc., of Birmingham, Triplex Holdings, Limited, and Weldall & Assembly, Limited, of Stourbridge.

Mr. Marples accepts the resignation in a letter in which he says that he told Sir Graham on March 3 that he was arranging, with the concurrence of both sides of the industry, that a sub-committee should be set up to consider the future of the industry. "This sub-committee will in this way carry out the inquiry you had in mind."

WESTLAND WHIRLWIND helicopter, operated by Bristow Helicopters, Limited, has been hired by the Marley Tile Holding Group for a three months' trial period to run a private air service for top executives between the company's headquarters and its factories.

India Urged to Import More Mining Equipment

TO facilitate the expansion in coal output envisaged in the third plan, India will require substantial imports of mining equipment and machinery, said Mr. R. H. Wright, chairman of the Indian Mining Association, at its annual meeting in Calcutta last Friday. Mr. Wright expressed alarm at the recent drastic reduction in import permits and appealed to the Government to give priority to the import of spares, since many items of machinery were lying idle at collieries, representing considerable capital investment on which no return was received.

The ban imposed some six weeks ago on coal exports to markets other than Pakistan was criticized. Mr. Wright said that the tonnage involved to maintain the traditional markets, including Burma and Ceylon, was not very large and foreign exchange earnings from these were equivalent to the total value of the annual allocation of exchange permitted to the private sector of industry to cover imported plant and machinery.

After deprecating the controversy over private and public (State) sectors, Mr. Wright suggested that future production targets should be decided on the basis of each sector's capacity for technical and managerial know-how. Out of India's 1959 total output of about 47,000,000 tons, the private sector contributed more than 40,000,000 tons. He was confident that the bulk of the contemplated increase in the third plan target (provisionally 90,000,000 tons) could be achieved if only the Government could take a realistic view and create favourable working conditions for industry.

Mr. Wright claimed that present selling prices were unremunerative and that many coal companies could not cover rising production costs, let alone find funds for expansion.

America Taking a Broader View of Foreign Tenders

SIGNS that the US is taking a broader view of foreign tenders for the supply of equipment were mentioned by Lord Nelson, chairman of the English Electric Company, Limited, at the company's annual meeting on Thursday of last week. One problem was compliance with the US specifications. Non-compliance meant the rejection of any tender, but there had been cases where the US organizations had given home concerns an opportunity of revising their tenders when they had not complied.

"We have not been fortunate enough to get even the impression whether our tender has complied," Lord Nelson commented. "But we must not get depressed. We have got several million pounds worth of business from them now, which is an indication of their change of mind—or at least a percentage of their country's change of mind—in the need for proper world trading on which undoubtedly the future of the world depends."

English Electric had succeeded in achieving a greater turnover in 1959 than ever before, but in the face of severe competition profit margins were substantially reduced.

POLISH MINERS from France presented Pope John with a miner's lamp at a general audience in St. Peter's, Rome, on Sunday.

Gear Information Centre Urged for Britain

ESTABLISHMENT of a gear information centre in Britain to collate the results of all research was suggested on Thursday of last week in Glasgow by Dr. C. Timms, head of the mechanisms, metrology, and noise control divisions of the National Engineering Laboratory, at East Kilbride. Dr. Timms, who was presenting the 1959 Viscount Nuffield paper, "Recent Developments in Spur and Helical Gears," to the Institution of Engineers and Shipbuilders in Scotland, said the UK was still dependent on foreign supplies of measuring instruments of the highest precision.

In Britain, the manufacture of gear instrumentation was piecemeal and too often regarded as a sideline. There was thus no counterpart to well-established firms abroad. Basic work in this country had provided a new approach to engineering measurement and machine control and it was hoped that machine-tool manufacturers and instrument firms would take advantage of it.

There was need for improvement in the accuracy of gear-cutting machines in the small and medium size range. The production capacity for the grinding of spur and helical gears above 3 ft. in diameter was limited to machines of foreign make.

Shannon Estuary Scheme for Iron-ore Shipments

ABOUT £20,000,000 is to be spent on the development of the River Shannon estuary, chiefly for the introduction of iron-ore cargo shipments. The scheme is planned by the new large undertaking known as Shannon Estuary Development Company, which has, during the past year, bought considerable tracts of land on each side of the estuary.

A spokesman for the company, whose scheme was outlined to Limerick Harbour Commissioners on Saturday, said that large ships would discharge their iron-ore cargoes at the company's premises. These cargoes would then be broken down into smaller ones for shipment by smaller vessels to ore ports of Britain and the Continent, where larger vessels could not be handled.

Plans include the construction of a jetty said to be six times longer and 10 times more costly than the jetty at Whitegate Oil Refinery, Cork Harbour. The company also plans to start a number of industries adjoining its undertaking.

RAW MATERIAL PRICES DOWN

PROVISIONAL drop of 0.6 per cent. in the Board of Trade index of prices of the basic materials and fuels used in manufacturing industry was caused by price reductions in many raw materials last month. The index now stands at 103.1 (1954=100).

Zinc was one of the commodities which became cheaper during the month, but there was an increase in copper prices. For the third month running the index of prices of manufactured goods remained unchanged at 112.0 (1954=100).

MOBIL OIL COMPANY, LIMITED—Mr. Miles B. Reid has resigned from the board.

European Coal Consumption

LAST YEAR'S LEVEL SHOULD BE MAINTAINED

EXPANSION of more than 6 per cent. in industrial output is likely to allow coal consumption to remain at last year's level, despite competition from other forms of energy, according to a statement by the High Authority of the European Coal and Steel Community. The improved demand in recent months is likely to continue in the second quarter of 1960. Average weather conditions, which would mean lower temperatures than last year's, are expected to bring about a slight increase in domestic demand.

The quarterly meeting in Luxembourg between delegates from the community's member-states and the OEEC Coal Committee estimated that coal demand would be 3 per cent. higher than deliveries in the corresponding quarter of last year. Main reason for the improvement is the production of coke for the steel industry, which is likely to take about 7 per cent. more coking coal than in the 1959 period.

Exports of both coal and coke to countries outside the community are also expected to rise slightly. Imports from non-member countries are estimated at 4,400,000 tons, a decrease of 350,000 tons on amounts received in the second quarter of 1959. Production is estimated at 2,600,000 tons lower than in the corresponding period last year. This figure does not take into account possible short-time working, which, the Coal Committee states, cannot be estimated.

Coke Output Rise

The result of changes in production and demand would be the production of a surplus of about 2,000,000 tons, less any tonnages lost through short-time working. Any surplus would be added to the 30,500,000 tons of coal expected in pithead stocks on April 1.

Demand for metallurgical coke is expected to rise by 1,200,000 tons because of strong demand from the steel industry. Coke output will rise by a similar amount, leaving stocks in producers' hands unchanged at 7,700,000 tons.

Estimated tonnages for the second quarter of the year are:—Output (without deductions for short-time), 59,300,000; imports from non-members, 4,400,000; own consumption, 7,300,000; exports to non-members, 1,000,000; increase in stocks (assuming no short-time working), 2,000,000.

The High Authority has stated that it would be prepared to accept the formation of a coal sales' syndicate on the Ruhr if certain giant concerns were excluded. Approval is also given for the establishment of a compensation fund by Ruhr producers or the West German Government to obviate extra-sharp competition. The Authority has also made it known that if such a syndicate is rejected by the Ruhr an application could be made to revise the cartel conditions in the ECSC Charter.

The suggestion for a syndicate without outsiders was rejected last week by only five votes to four (two French and two German representatives) and then a proposal for a syndicate with outsiders was passed with a big majority.

Miners' Boxing at Hanley

FIRST semi-finals of the National Coal Board amateur boxing championships will be staged at the Victoria Hall, Hanley, Stoke-on-Trent, tomorrow (Saturday), when the divisional champions from the East and West Midlands, the South-Western, and South-Eastern divisions of the NCB will meet to decide the 10 winners who will contend for the national titles. Eliminating bouts will start at 2.30 p.m. and the programme of finals and special contests at 7 p.m.

A feature of this year's NCBABA championships is the fact that, after an absence of two years, the South-Western Division has again entered the field. The Welsh boxers are young—the eldest is 23—and all will be appearing at the NCBABA championships for the first time.

Divisional champions from Scotland, Durham, and Yorkshire will meet at the Town Hall, Leeds, on April 9, and the national finals, on April 23, will be at the St. Andrew's Hall, Glasgow.

France Urges More Freedom for Coal in Common Market

ENERGY market can be organized on a European-wide basis only if all power media have the same degree of competitive freedom, says a policy statement from the Charbonnages de France coal-mining group, ceiling organization of the country's nationalized coal industry. The statement points out that coal producers are governed by strict rules, as, for example, in the publication of price lists, while the oil industry and importers are allowed full price freedom.

The "vertical" structure of the European oil industry, the statement goes on, is another advantage not enjoyed by the coal-producing industry within the Common Market area. Import policies for coal, mineral oil, and natural gas must be worked out in harmony by the six member Governments so that each branch is treated fairly.

TOUR OF THE CITY, to see how it works, is to be undertaken in the next few weeks, by about 30 foremen from the Morgan Crucible Company, Limited, of London, S.W.11. This is a result of the conference organized by the Industrial Welfare Society in February when City financial experts talked to senior managers and executives from industry.

Austrian Plans for Steel Expansion

TURNOVER of about 5,300,000,000 schilling (£66,250,000) was achieved by the Austrian State-owned steel concern VOEST with an output of 1,300,000 tons of pig-iron, 1,300,000 tons of raw steel, and about 1,000,000 tons of rolled products. This compares with a 1958 turnover of 4,800,000,000 schilling (£60,000,000). Investments in 1959 were 500,000,000 schilling (£6,250,000) which was met by the company's own resources. The export share of all sales rose from 53 per cent. to 58 per cent.

The concern plans expansion of pig-iron and rolled steel capacity at a cost of 670,000,000 schilling (£8,375,000). Among new plant will be a blast furnace with a daily capacity of 1,400 tons, to be opened on August 1, and a second cold-rolling mill to be put into operation on July 1.

Planned output for 1960 is 1,500,000 tons of pig-iron, 1,700,000 tons of raw steel, and between 1,100,000 and 1,200,000 tons of rolled goods. Turnover for the current year is expected to be about 6,200,000,000 schilling (£77,500,000). The VOEST concern sees a bright future in the world for the Austrian-developed Linz-Donawitz steelmaking process. Total LD-capacity is now only about 9,150,000 tons a year, but by 1965 this figure should have risen to about 25,000,000 tons.

Exports of Austrian refined steel rose last year by 4 per cent. on 1958, from 107,000 tons to 111,000 tons.

Germany and Italy

Stabilization of export prices for ECSC-made steel is reported by the High Authority. Approximate export prices, in US dollars per ton, are quoted by the High Authority as:—Ferro-concrete grades, 100; ingot, 103 to 106; profiles, 98 to 100; rolled wire, 118 to 120; medium plates, 110 to 112; basic boiler plates, 102 to 105; ships' plates, 115; hot-rolled thin plates, 155 to 160; cold-rolled thin plates, 185.

Price increases are announced by the Italian firm of Bertoli & Rodolfo for forging ingots by 1.7 per cent., re-rolling ingots by 1.8 per cent., forged semi-products by 1.5 per cent., semi-products for re-rolling by 3.3 per cent., ferro-concrete round steel by 3 per cent., and 50 mm. to 80 mm. ingot steel by 1.4 per cent. The Sardi plant has reduced its ferro-concrete round steel prices by 5.4 per cent., thus coming into line with other manufacturers.

Standing orders for thin sheet on the books of West German producers are—at 1,120,000 tons—more than double those of a year ago. Tinplate orders of 126,000 tons are also twice the 1959 level and orders for galvanized and leaded sheet rose from 14,000 to more than 56,000 tons.

German iron production last week with output for the first week in March and the second March week of 1959 in parentheses, was as follows:—pig-iron, 381,200 (380,200 and 199,000) tons; raw steel, 471,200 (468,800 and 254,100) tons; rolled steel semi-manufactures, 161,700 (159,500 and 80,400) tons; and rolled steel finished products, 233,600 (240,800 and 130,800) tons.

US STEEL COSTS MAY RISE

AS a result of the US steel strike settlement and increased cost of material, the cost of producing steel may rise as much as $13.50 a ton during the next 30 months, said Mr. R. L. Gray, chairman of Armco Steel Corporation, of Middletown, Ohio, in a statement to the Business Association of Kansas City.

Buyer Sought for Newman Spinney Power Station

POWER station constructed as part of a joint £2,000,000 experiment by the Central Electricity Generating Board and the National Coal Board, is for sale. The station, which stands on the Derbyshire moors at Newman Spinney, near Chesterfield, was revolutionary in that it was powered by gas produced by burning coal in seams below ground.

Valuable data on the underground gasification of coal have been obtained since work on the site began three years ago, but it was always envisaged that the project would be temporary and that the site would eventually be returned to agricultural use.

It is expected that a likely purchaser of the generating plant would be an under-developed state such as Bolivia or Yugoslavia, with readily available fuel supply. A CEB spokesman commented: "The plant will run equally well on gas or oil, and could easily be adapted for use with conventional coal-fired boilers. It has a capacity of 3.75 megawatts, large enough to power a large factory or a small town."

The buildings will be demolished scientifically as soon as the generating plant is sold. They were built by using powdered fuel ash instead of sand in the concrete, and as the walls are knocked down their strength will be measured.

Williams & Williams Plans Group Change

PROPOSALS to reorganize the UK business of Williams & Williams, Limited, metal window manufacturers, of Chester, and to dispose of certain assets abroad, are made by the company's recently reconstructed board. The company will probably need to borrow up to £500,000 from its bankers in addition to the existing secured borrowing of £250,000. These additional facilities will be made available by the bankers upon having them secured by the issue of £250,000 6 per cent. debentures 1975-80 to rank *pari passu* with the existing 5½ per cent. debentures.

Among the proposals are raising the borrowing powers by £500,000 to £2,250,000 to create the additional £250,000 debentures, to increase the rate on the existing 5½ per cent. debentures to 6 per cent. from May 1 next, and to make a proportionate increase in the debenture sinking fund to £26,667 a year.

Group net profits fell to £20,118 (£134,397) in the year ended April 30, 1959, and the dividend was cut from 12½ per cent. to 5 per cent.

£4,000,000 Smelting Furnace Project

AT a total cost of about £4,000,000, the Rhodesia Broken Hill Development Company, Limited, is to install an Imperial smelting furnace in Northern Rhodesia. About £400,000 has already been spent on securing rights and designs of the process.

The development is expected to be completed by 1962, and will entail the installation of a third generator at the Lunsemfwa hydro-electric site at a cost of £350,000. When in operation, the process is expected to improve the combined recovery of lead and zinc from about 60 per cent. to over 85 per cent. from ore mined, and also recover some 200,000 long tons of these metals from now untreatable stocks.

High-speed Tunnel Drivage

Part 1: DRILLING, STEMMING, and SHOTFIRING

By B. T. HOULDEN, Ph.D.

Results of studies of tunnelling work in selected National Coal Board, hydro-electric, and German coal industry tunnels by the NCB's operational research group during a period from 1953 to 1955, are given in this article, which is being published in IRON AND COAL *in three parts. In the first part, the author, head of the Field Investigation Group of the NCB, compares the drilling methods used and gives the performances observed. Reasons for the different drilling performances are deduced and suggestions are made for improving NCB drivage rates. Part 2 of this article, which will appear next week, compares the different results obtained with the use of loading equipment, and the concluding Part 3, will cover the organization necessary for high-speed drilling.*

ALTHOUGH tunnelling rates have improved since 1955 there are still many tunnels operating well below maximum efficiency and it is hoped that publication of this paper will help to indicate general improvements which can still be made to increase the efficiency of tunnel drivage.

The development of high-speed tunnel drivage methods is of major importance in the British coal industry both for new collieries and at collieries where reconstruction is being carried out. The economic importance of efficient tunnelling is clearly demonstrated in a paper to the Institution of Mining Engineers by R. G. Watt[1]. In new collieries the interest accumulating on capital invested in shaft sinking over a period of years makes it imperative that tunnels should be advanced as speedily as possible.

For a typical colliery, planned to cost about £10,000,000 to develop to full production, the saving in interest charges alone if tunnel drivage can be completed a year under schedule is £450,000.

Faster drivage would also make earlier production of coal possible. In addition, there are a number of collieries where development has not been planned sufficiently early and hence high-speed drivage is necessary to open up new districts and maintain production at a reasonable level.

At collieries where reconstruction is being carried out and the rate of advance is restricted either by design or by the need to wind coal at particular times, the cost of drivage must be kept to a minimum.

Thus men and machines must work to a high

TABLE 1.—*Drilling Equipment and Performances.*

Strata.	Excavated area, sq. ft.	Drilling equipment.	Concentration of drills per 100 sq. ft.	Penetration rate, in./min.	Drilling rate per drill, in./min.	Drilling rate per equipment, in./min.	Drilling rate per equip't / Penetration rate × 100
NCB tunnels							
Sandstone	145	2 Holman Silver Dart, with airlegs	1.4	13.0	9.3	16.6	128
Sandstone and shale	150	2 Holman Silver Three, with airlegs	1.3	19.5	10.2	16.3	84
Sandstone and shale	150	1 Holman Silver Three and 1 Atlas 757, with airlegs	1.3	18.0	13.9	22.5	125
Hard sandstone, shale with ironstone nodules, coal, and dolerite	126	2 Holman Silver Dart	1.6	11.2	7.0	12.2	109
Shale and sandstone	153	3 Holman SL200, with airlegs	1.3	19.0	10.9	21.7	114
Hard sandstone, shale, and ironstone nodules	180	2 Holman SL250, rig mounted	1.1	13.3	8.8	15.5	117
Shale and sandstone	126	3 Holman SL280, rig mounted	1.6	32.5	26.0	40.7	125
Sandstone and shale	159	2 60N drifters, rig mounted	1.9	30.8	20.0	28.5	93
Shale	126	Hardypick rotary	0.8	32.1	12.7	11.0	34
Mudstone and nodules	167	1 Hand-held electric	0.6	23.5	12.1	11.7	50
Hydro-electric tunnels							
Mica schist	44	4 Atlas 656-2W, with airlegs	9.1	9.0	6.4	15.5	172
Mica schist	44	4 Atlas 656-2W, with airlegs	9.1	6.9	6.5	22.8	330
Epidiorite	88	5 Atlas 656-2W, with airlegs	5.7	15.6	14.3	67.2	431
Mica schist	185	6 Atlas 656-2W, with airlegs and rail-mounted platform	3.2	15.7	13.3	59.2	377
German tunnels							
Hard sandstone	205	5 Heavy hammer drills, rig mounted	2.4	24.0	19.0	55.7	232

degree of efficiency. The present efficiency of working can be much improved by the application of the principles involved in the development of high-speed tunnelling techniques.

Drivage Rates Oversea

Between 1953 and 1955, when these studies were made, rates of advance in stone drivages of the National Coal Board rarely exceeded 120 ft. per week, and averaged about 30 ft. per week throughout the industry. In hydro-electric tunnels, however, the maximum advance recorded in a week was 557 ft.[2] and speeds of 150 ft. to 300 ft. per week were commonplace. The world record of 2,856 ft. of drivage in a month was held by the crews driving a tunnel in Czechoslovakia[3]. Similarly, average speeds of 1,394 ft. in 26 working days in South Africa[4] and 1,642 ft. in a month and 551 ft. in a week in the US[5] have been recorded.

Since the completion of the work reported here, tunnelling rates in the National Coal Board have been improved, the average speed in all tunnels now being about 40 ft. per week, the highest speed being 315 ft. in seven days[6]. Some, but not all, of the difference between NCB and other drivage rates is attributable to conditions (*e.g.*, in most hydro-electric tunnels no supporting is necessary other than near the portal). Most published papers on tunnelling have described methods in particular tunnels. This paper, however, summarizes the findings of studies of tunnelling work in 30 tunnels.

The objectives of the studies were to suggest how NCB tunnel drivage methods could be improved, to estimate what rates of advance should result and

TABLE 2.—*Summary of Average Times Spent During the Complete Drilling Cycles in NCB Tunnels.*

Drilling equipment.	Strata	No. of holes per round.	Average length of holes (ft.).	Length of drill rods used (ft.).	Size and types of bits.	Total drilling cycle (min.).	Breakdown of drilling cycle (min.)				Average time per hole (sec.)				
							Preparing to start drilling	Time spent drilling	Matching up	Clearing away		Penetration	Withdrawal	Manoeuvring	Ho... ar...
I. COMPRESSED AIR DRILLS															
2-AIR LEGS															
2 Holman Silver Dart airlegs	Sandstone	42	4·0	4	1⅛-in. Padley and Venables rip bits and tungsten carbide bits	122	10	109	3	0	301	211	8	21	
2 Holman Silver Three airlegs	Bituminous sandstone and shale	44	5·8	6	1⅛-in. Holbits	190	30	150	10	0	410	215	19	29	
1 Holman Silver Three and 1 Atlas 757 airlegs	Shale sandstone and coal	41	7·0	7	Holbits	153	27	124	1	1	363	279	48		
2 Holman Silver Dart airlegs	Hard sandstone shale with ironstone nodules, coal and dolerite	29	7·1	8	1⅛-in. Holbits	202	10	176	15	1	657	455	44	85	
3-AIRLEGS															
3 Holman SL 200 airlegs	Bituminous shale and sandstone	32	7·2	8	Holbits	128	31	85	7	5	477	273	26	53	
2-DRILL RIGS															
2 Holman SL 250 drills on Joy Sullivan T2 truck	Disturbed sandstone and hard argillaceous shale	45	7·5	7½	1⅛-in. Holbits	260	21	230	7	2	613	405	16	89	
2 60N drifters on a Joy Sullivan rig	Hard shale and sandstone	48½	6·0	7	1⅛-in. Holbits	86	14	67	3	2	165	132	24		
3-DRILL RIG															
3 Holman SL 280 drills on a Joy Sullivan	Shale, sandstone and coal	33	6·1	8	1⅛-in. Holbits	85	39	40	1	5	219	142	6	31	
II ELECTRIC DRILLS															
1 DRILL-RIG ON TRACKS															
5 H.P. Hardypick on tractor	Medium shale	23½	5·9	5 & 7	Rip-bits	151	14	131	—	6	335	165†	14	99	
1 HAND-HELD BORER															
1 Holman hand-electric	Dark grey mudstone with ironstone nodules and siliceous bands	29	6·9	6 & 8	1⅛-in. Semens	206	6	200	—	0	414	213	122		

to assess the effect of the higher rates of advance on drivage costs. Watt[1] gives detailed examples of the expected costs of high-speed drivage. This part of the work will, therefore, only be briefly summarized.

The study was limited to consideration of methods involving the normal cycle of tunnel work (*viz.*, drilling; charging, stemming, and firing; loading; and supporting, if necessary). Continuous tunnelling machines did not come within the scope of the investigation.

Method of Study and Analysis

Three sets of studies were made:—(1) Visits to NCB tunnels where rates of drivage were the highest in the industry for the various equipments being used. In these tunnels the average weekly advance was 50 ft.; (2) visits to German coal industry tunnels which were being driven at average speeds of about 150 ft. per week; (3) visits to four of the North of Scotland Hydro-Electricity Board tunnels, where average speeds of up to 240 ft. per week were being attained.

Visits were made to 24 NCB tunnels, four hydro-electric tunnels and two German coal industry tunnels. Thirteen of the NCB tunnels were visited only to study particular parts of the cycle (*e.g.*, five tunnels to study the MC3 loader, two tunnels to study roof bolting). At the remainder, full cycles of tunnelling work were studied.

The tunnels varied from 44 to 205 sq. ft. in cross sectional area, mainly on fairly level gradients. The conclusions are, therefore, limited to gradients of less than 1 in 20. Drilling equipment included two to six airleg-mounted drills, two and three percussive drills mounted on rigs, five heavy percussive drills on a platform, hand-held rotary drills and a Hardypick rotary drill rig. The loading equipments studied were Eimco 40 to mine cars, a German Bergtechnik loader to mine cars, MC3 to conveyor, MC3 to tubs, MC2 to conveyor, Conway 60 to mine cars, two Eimco 21s to tubs, one Eimco 21 to tubs, Duckbill to conveyor, and Joy Slusher to end-tipping cars.

At each tunnel, detailed time studies were made of each operation through three or more shifts of face work. The methods of performing the operations and standards of work were also noted. In each case the tunnel records were studied to show how typical the observed work was of the normal rate of advance. The operational times have been grouped together in similar classes (*e.g.*, tub changing times, drilling penetration times) and fitted together into the average cycle observed.

Average time per hole broken down into component times (sec.)

Changing bits and steels	Breakdowns	Rod jammed in holes.	Faulty holes.	Oiling.	Water and compressed-air lead failures.	Drills impeding each other.	Waiting for compressed air water or electricity.	Other drill doing work not normally part of face work.	Miscellaneous.
0	37	5	4	5	2	0	0	0	1
0	51	31	0	0	15	0	0	36	3
0	0	0	0	0	0	0	36	0	0
11	0	0	0	31	0	0	0	0	1
0	52	13	0	11	0	9	0	—	16
18	54	7	9	3	7	0	0	0	5
1	0	0	0	0	7	0	0	0	1
0	30	0	0	0	0	7	0	0	3
32*	4	2	0	0	9	—	0	—	10
39*	4	17	0	0	—	—	9	—	10

DRILLING

In the NCB tunnels, drilling rounds (including preparation and clearing away times) took 85 to 260 min. for total hole lengths of 168 to 337 ft. In one hydro-electric tunnel 184 ft. of holes was drilled in 33 min. and in the German tunnel 690 ft. in 119 min.

Airleg-mounted percussive drills were used in all the hydro-electric tunnels visited and heavy platform-mounted percussive drills in the German tunnel. In the NCB tunnels, airleg-mounted percussive drills or rig-mounted percussive drills were generally used, but there were also tunnels where hand-held or tractor-mounted rotary drills were used.

The number of drills used was three, four, five, or six in the hydro-electric, five in the German and one, two, or three in the NCB tunnels. The concentration of drills per unit area of face was greater in both the German and hydro-electric tunnels than in the NCB tunnels. This difference in drill concentration has a marked influence on the time of the drilling part of the cycle.

* A short and a longer drill rod were used for each hole, though not always in succession. The time of changing from the shorter to the longer rod and until penetration starts has in these cases been put under "Changing bits and steels," which also covers the time taken to take bits off rods, etc.,
† This figure includes about 32 sec. feeding twice to face, where this interferes with the drilling.

TABLE 3.—*Penetration Rates Attainable with Different Types of Drill in Different Strata.*

Type of drill.	Penetration rate, in./min.			Overall drilling rate, in./min.		
	"Hard" strata.	"Medium" strata.	"Soft" strata.	"Hard" strata.	"Medium" strata.	"Soft" strata.
Airleg mounted percussive	10	15	20	6	9	11.5
Rig-mounted percussive	15	22.5	30	9	12	15
Platform-mounted percussive heavy type drills	25	37.5	50	11	12.5	14
Hand-held rotary	—	22.5	30	—	11	14
Rig-mounted rotary	20	30	40*	9.5	13.5	17
Rig-mounted rotary percussive	20†	30†	40†	17†	22†	25†

* The penetration rate for "soft" strata is that with a Hardypick drill rig. Higher drilling pressures will give higher penetration rates than the figures given.

† The figures for rotary-percussive drills are based on studies of the first two rail-mounted Hausherr rigs used by the NCB. While the penetration rates with these drills were good they were considerably less than those obtained either under laboratory conditions at the Mining Research Establishment or in normal development work on the Continent.[6] Low compressed air pressure (50 lb./sq. in. as compared with 80 lb./sq. in.) contributed to this difference. The effective overall drilling rate was comparatively poor due to the design of the rig and due to the difference in penetration rates.

Table 1 gives the drilling equipment used, together with performances. Three figures are given:—(*a*) Penetration rate; (*b*) drilling rate per drill—the rate of drilling per drill for all times involved in the drilling part of the cycle other than preparation and clearing away, *i.e.*, the rate of drilling while the drills are at the face; and (*c*) drilling rate per equipment—the total length of holes drilled by all the drills used, divided by the total time of the drilling part of the cycle including preparation and clearing away times.

Although the penetration rates in NCB tunnels are generally higher, due to strata hardness, than in hydro-electric tunnels, the drilling rates per equipment are considerably lower. Similarly, the ratio $\frac{\text{Drilling rate per equipment}}{\text{Penetration rate}}$ in the German tunnel is much higher than in NCB tunnels.

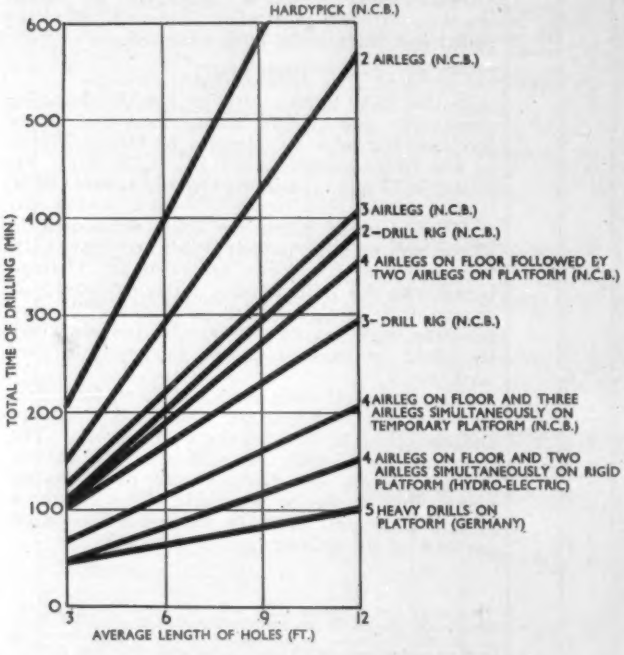


FIG. 1.—ESTIMATED DRILLING TIMES IN HARD COAL-MEASURE STRATA FOR 16-FT. BY 12-FT. TUNNELS.

Table 2 summarizes the times for drilling in the NCB tunnels.

In hydro-electric tunnels the average preparation time with airleg-mounted drills where no platform was used was 5 min. In one tunnel the time was 1 min. Where a permanent platform was used a total preparation time (including moving the platform to the face) of 12 min. was necessary. In NCB tunnels the average preparation time, including erection of a platform where airleg-mounted drills were used, was 21 min. With rig-mounted drills the average time was 25 min. Some improvement in preparation time should be possible in NCB tunnels.

The time for clearing away before charging could start averaged 2 min. in NCB tunnels. This is comparable with the times for clearing away in hydro-electric tunnels and is considered satisfactory. The average total time per hole for withdrawing and manœuvring airleg drilling machines in hydro-electric tunnels varied from tunnel to tunnel, but was always less than a minute. In the German tunnel with the heavier drills the time was 98 sec. In five of the NCB tunnels the times were high. With airleg-mounted drills in two tunnels the time was 103 and 159 sec. With one of the percussive drill rigs the time was 105 sec. With rotary drills the times were 113 sec. (rig mounted) and 122 sec. (hand-held). Thus, although in some NCB tunnels times were satisfactory, there are a number of tunnels where improvements should be possible.

In hydro-electric tunnels delays such as machine breakdowns, changing bits, faulty holes, etc., totalled 7 per cent. of the time the drills were in use, whereas in NCB tunnels the figure was 13 per cent. The times taken to replace an

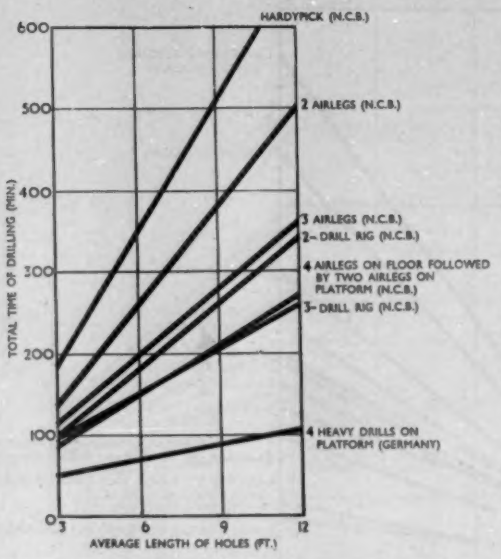


FIG. 2.—ESTIMATED DRILLING TIMES IN HARD COAL-MEASURE STRATA FOR 14-FT. BY 10-FT. TUNNELS.

airleg-mounted drill when a breakdown occurred were six, seven, and 15 min. in hydro-electric tunnels. In the NCB tunnels replacing a drill often occupied ½ hr. or more. Delays due to drill breakdown were less frequent in hydro-electric than in NCB tunnels.

Although the time of changing bits or steels was usually similar in NCB and hydro-electric tunnels, there were some NCB tunnels where excessive delays were caused by spare bits and steels not being available at the face. Delays due to outside influences, such as waiting for power, averaged 4 per cent. in NCB tunnels and 1 per cent. in hydro-electric tunnels.

Estimated Drilling Times

Figs. 1 to 12 give estimated times for the drilling part of the cycle using various methods of drilling under a variety of conditions. These times are based on the speeds of working observed in the NCB, hydro-electric and German tunnels visited and are thus typical of a good level of efficiency of operation. Less efficient working will increase the times considerably.

For the purpose of this paper strata likely to be encountered in colliery drivages have been classified as "hard," "medium," or "soft." "Hard" strata includes sandstone and sandy shale with silica or iron nodules. "Medium" strata covers the sandy or strong shales. "Soft" strata includes soft shales, mudstones, etc. Times for drilling in very hard fine grained sandstone (burr, whin, etc.) may be slightly more than those given for "hard" strata. Similarly with coal, drilling times will be less than those given for "soft" strata.

Although, at present, holes as long as 12 ft. are not normally drilled in NCB tunnels, times for 12-ft. holes have been estimated to demonstrate the effect of long pulls on drivage rates. The estimations have been made by assuming that penetration time depends on the hardness of strata and is proportional to the length of hole drilled and, that withdrawal, manœuvring, and all the other delays are proportional to the penetration time. This estimate is better than other alternatives which have been considered.

To drill a face rapidly a selection must be made between the following types of drill:—(*a*) Percussive: (*i*) airleg-mounted, or (*ii*) rig or platform-rig mounted; (*b*) Rotary: (*i*) hand-held, or (*ii*) rig- or platform-rig mounted; (*c*) Rotary percussive: (*i*) rig- or platform-rig mounted (a platform-rig for rotary percussive drills has not yet been developed). Selection will be based on conditions. A drill with a high penetration rate does not ensure rapid drilling of the round. Both the overall drilling rate (*i.e.*, including manœuvring, etc.) and the number of drills that can be used must be considered.

Table 3 gives the penetration rates attainable with each of the above types of drill in different strata and also the overall drilling rate per drill (*i.e.*, the total length drilled by the drill ÷ time of drilling cycle including all delays and the setting up and withdrawal of drilling equipment before and after drilling).

With the data available it is impossible to distinguish between the performance of similar drills made by different manufacturers.

The number of hand-held rotary drills that can

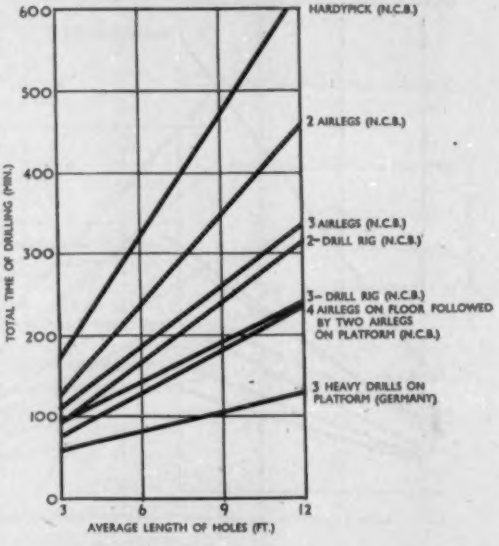


FIG. 3.—ESTIMATED DRILLING TIMES IN HARD COAL-MEASURE STRATA FOR 12-FT. BY 9-FT. TUNNELS.

be used in a given space is limited due to the need for two or more men to operate each drill. Such drills are, therefore, unsuitable for high-speed drivage. Similarly, not more than two rig-mounted rotary drills can at present be accommodated in a tunnel. This makes them also unsuitable for high-speed drivage.

A larger number of airleg-mounted percussive drills than rig-mounted percussive drills can be used in a tunnel of given size. Choice will, therefore, depend on:—The type of strata expected; the type of loader to be used (the size of the loader may prevent the use of rig-mounted drills), and the expected comparative overall drilling times of the optimum concentration of drills.

An example of a very high concentration of drills being used in a tunnel comes from Czechoslovakia[3], where a 113-sq. ft. cross-sectional area tunnel in hard shale was being drilled with 12 airleg-mounted drills operating simultaneously. Twenty-six holes of the wedge cut between 9.8 ft. and 11.5 ft. in length were drilled in 55 min. by a crew of nine operators (six drillers, presumably each holding two drills, and three assistant drillers). Such a high concentration of drills would not be practicable with rig mounting.

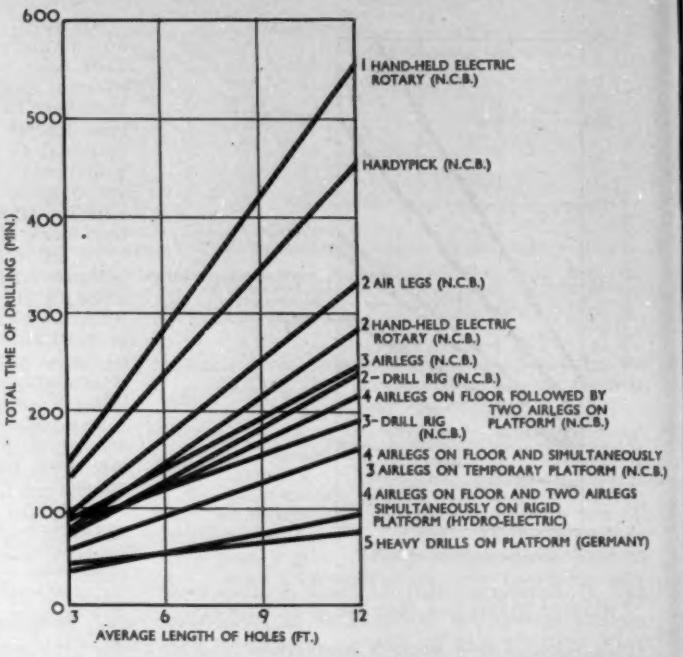


FIG. 5.—ESTIMATED DRILLING TIMES IN MEDIUM COAL-MEASURE STRATA FOR 16-FT. BY 12-FT. TUNNELS.

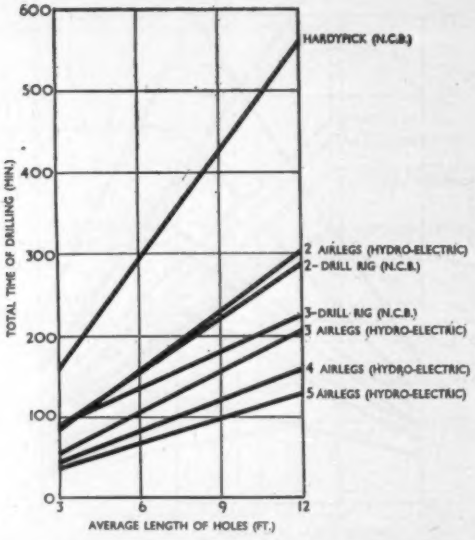


FIG. 4.—ESTIMATED DRILLING TIMES IN HARD COAL-MEASURE STRATA FOR 10-FT. BY 8-FT. TUNNELS.

Comparison of the graphs in Figs. 1 to 12 shows that the drilling equipment greatly affects the drilling time (*e.g.*, for 6-ft. holes in hard strata in 16-ft. by 12-ft. tunnels, the time of drilling with the usual NCB drilling equipment—two or three airleg-mounted drills—is about 4 hr. With either the German or hydro-electric methods, using a rigid platform, this can be reduced to under 1¼ hr.). For rapid drivage the number of drills used should be at least four and preferably more in the larger tunnels (*e g.*, 16 ft. by 12 ft.), selection of equipment being based on Figs. 1 to 12.

For given conditions, the maximum rate of advance can be achieved by selection of the best combination of equipment. Since each of the drilling equipments cannot be used with every type of loader there are some tunnels where the fastest drilling equipment will not be the one for maximum rate of advance.

Organization of the Work

The usual drilling pattern in NCB tunnels is the wedge cut or a modification of it. The burn cut is occasionally used. In hydro-electric tunnels the burn cut is preferred. Evidence suggests that a few more holes may be needed to fire the face with the burn cut than with the wedge cut, but

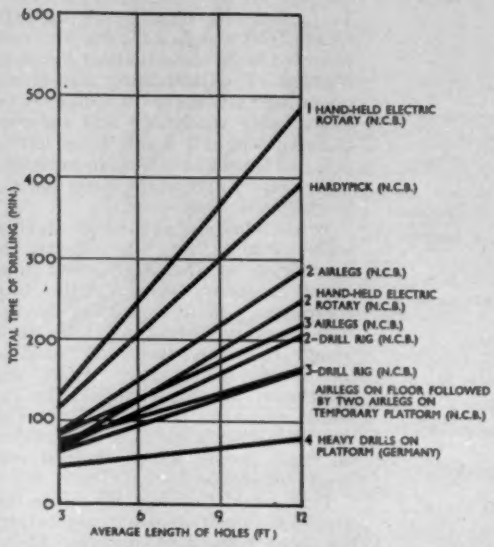


FIG. 6.—ESTIMATED DRILLING TIMES IN MEDIUM COAL-MEASURE STRATA FOR 14-FT. BY 10-FT. TUNNELS.

the difference in pull must also be considered. Although the burn cut may introduce some disadvantages, it facilitates the use of more drills simultaneously in a reduced space (parallel holes as compared to holes at various angles with the wedge cut). The burn cut should, therefore, be tried as an alternative to the wedge cut, using the optimum number of drills in each case.

An estimate of the number of holes and the charge required to fire a face with the wedge cut under particular conditions can be made using the formulæ given later. For the burn cut a few more holes will probably be necessary. Too many holes are preferable to too few, since the former may give more rapid loading than normal (due to better fragmentation), whereas, although the latter will reduce the drilling time, the face may not fire satisfactorily. Fragmentation should not be sacrificed to save drilling time by avoiding drilling holes in bands of hard strata.

Figs. 1 to 12 show that a round of 12-ft. holes can be drilled more rapidly than two rounds of 6-ft. holes and even more rapidly than four rounds of 3-ft. holes. Considering drilling time only, it is, therefore, best to drill as deep a round as practicable. To drill a face rapidly the holes should be shared so that all the drills start and finish together, and the thrust should be applied so that maximum penetration rate is attained.

The first of these requirements is not regularly completely attainable. With small (8 ft. high) and large (12 ft. high) tunnels it can nearly be attained. With tunnels between 8 ft. and 12 ft. high, men cannot normally be expected to work under a platform while others are drilling above them. Thus the drilling has to be broken into two separate parts—bottom holes followed by top holes. Owing to space limitations, fewer drills can be used to drill the top holes than for the bottom holes. Maximum penetration rate is dependent on the firmness of the footing for the thrust. With a temporary platform the footing is usually insecure and low penetration speeds result. With a rigid platform penetration speeds are equal to or better than those from the floor of the roadway.

In tunnels above, say, 12 ft. high, a permanent platform is preferable to a temporary one. With some loaders the design of a platform for drilling is limited. This may prohibit the use of a permanent platform in these cases. In tunnels between 8 ft. and 12 ft. high, where only temporary platforms are practicable, it is essential that as many holes as possible of the round should be drilled from the floor of the roadway, since more drills can drill these holes and because only a temporary platform will be suitable. The temporary platform, unless it is rigidly constructed, will give poorer penetration times for holes drilled from it. In tunnels 8 ft. and less in height, no platform need be used when drilling with airleg-mounted drills. It may be necessary to use a ladder to control the drills for the highest holes.

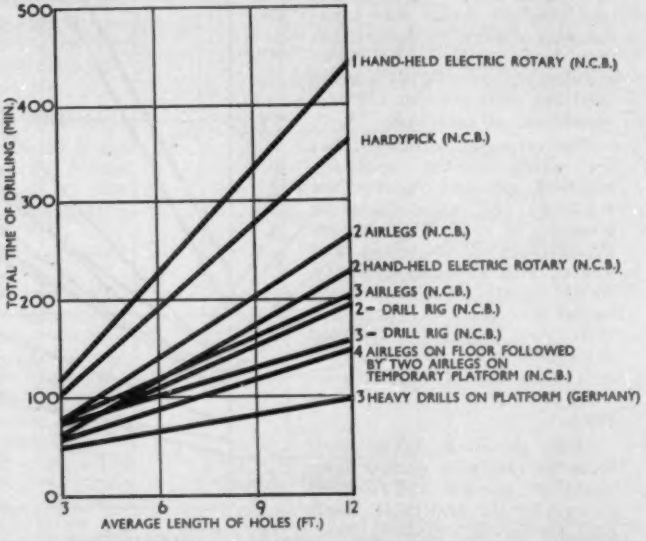


FIG. 7.—ESTIMATED DRILLING TIMES IN MEDIUM COAL-MEASURE STRATA FOR 12-FT. BY 9-FT. TUNNELS.

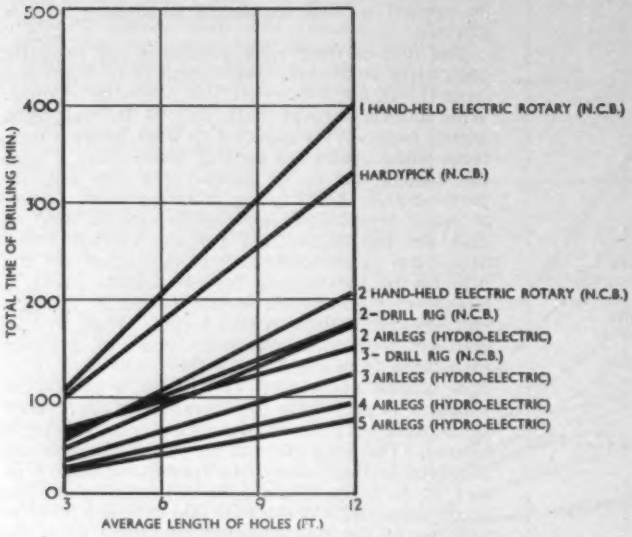


FIG. 8.—ESTIMATED DRILLING TIMES IN MEDIUM STRATA FOR 10-FT. BY 8-FT. TUNNELS.

With more and more drills at the face the work of the assistant driller becomes increasingly important because he has to plan his movements to keep delays due to moving airlegs to a minimum. With five airleg-mounted drills, as seen in one of the hydro-electric tunnels, the one assistant driller was performing a more important task than the five drillers. Thus, when a concentration of drills is being used the most efficient faceman should act as assistant.

The estimated drilling times for airleg-mounted and rig-mounted percussive drills are based on compressed-air pressures of about 75 lb./sq. in. Pressures of 90 lb./sq. in. and above, with adequate capacity, should be used in all high-speed tunnel drivages. Such pressures with compressed-air operated drills will give better drilling times than those in Figs. 1 to 12, with consequent higher drivage rates.

Drills should be taken away from the face after each drilling operation, greased, and returned in time for the next cycle. Each drill should be regularly overhauled and faulty parts replaced. This is done with airleg-mounted drills in hydro-electric tunnels.

To facilitate the handling of the drills to and from the face the use of a rail-mounted bogie to carry them is recommended. If a drill being used is not operating efficiently it should be immediately withdrawn and replaced unless it has only a few holes left to drill. It is usually useless to persevere with a faulty drill in the hope that the trouble will right itself.

Water and compressed-air flexible leads should not be allowed to deteriorate to the stage when they cause frequent delays to the face equipment. In a high-speed drivage tunnel every 10 min. lost costs about £1 when face and haulage labour are made idle. Water and compressed-air pipes should be to within about 60 ft. of the face. The number of separate taps and outlets on each should allow at least one spare connection.

Time could be saved if, before the previous operation (*i.e.*, supporting) had been completed, drills could be completely coupled up to the compressed-air and water supply. Spare drills, rods and bits should be within 100 ft. of the face during drilling, to minimize delays due to making replacements.

The crew must be trained to know the pattern

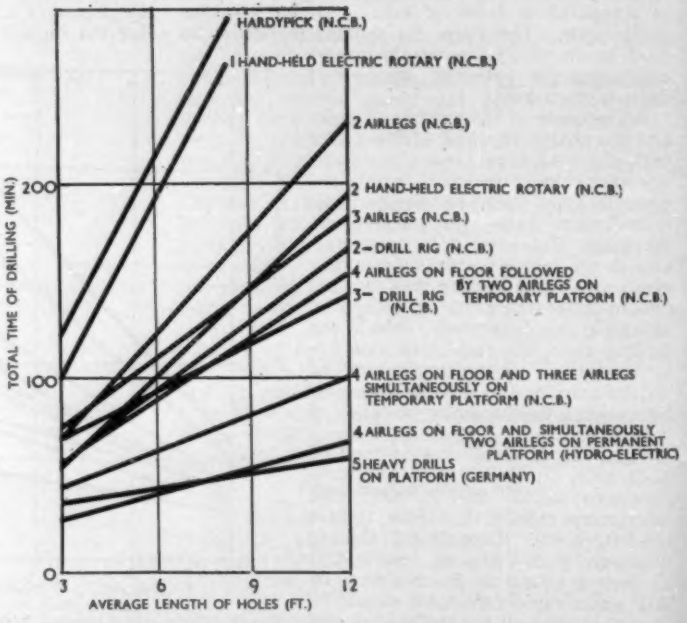

HARDYPICK (N.C.B.)
1 HAND-HELD ELECTRIC ROTARY (N.C.B.)
2 AIRLEGS (N.C.B.)
200
100
0
TOTAL TIME OF DRILLING (MIN.)
2 HAND-HELD ELECTRIC ROTARY (N.C.B.)
3 AIRLEGS (N.C.B.)
2- DRILL RIG (N.C.B.)
4 AIRLEGS ON FLOOR FOLLOWED BY TWO AIRLEGS ON TEMPORARY PLATFORM (N.C.B.)
3- DRILL RIG (N.C.B.)
4 AIRLEGS ON FLOOR AND THREE AIRLEGS SIMULTANEOUSLY ON TEMPORARY PLATFORM (N.C.B.)
4 AIRLEGS ON FLOOR AND SIMULTANEOUSLY TWO AIRLEGS ON PERMANENT PLATFORM (HYDRO-ELECTRIC)
5 HEAVY DRILLS ON PLATFORM (GERMANY)
3
6
9
12
AVERAGE LENGTH OF HOLES (FT.)

FIG. 9.—ESTIMATED DRILLING TIMES IN SOFT COAL-MEASURE STRATA FOR 16-FT. BY 12-FT. TUNNELS.

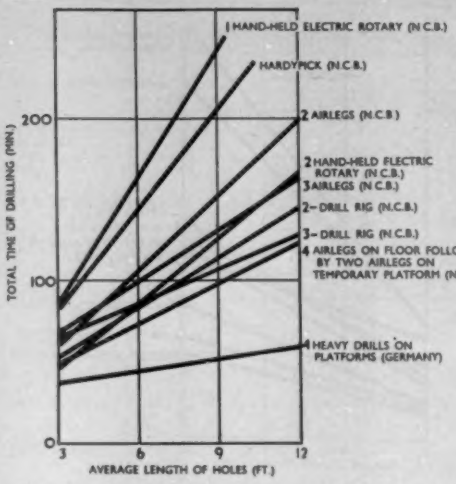


FIG. 10.—ESTIMATED DRILLING TIMES IN COAL-MEASURE STRATA FOR 14-FT. BY 10-FT. TUNNELS.

thoroughly, to manœuvre their drills rapidly and if trouble occurs to adjust rapidly the sharing out of the holes accordingly. They should also be able to change a faulty drill rapidly in less than 10 min. Spares and tools should be readily available.

Drills should be prepared for drilling before supporting is completed and should be ready at the face to penetrate the strata soon after supporting is finished. It may even be possible in some cases to start drilling while supporting is being completed. After each drill has completed its holes it should be removed from the face as quickly as possible to allow the remaining drills to operate more freely and also so that the next operation can be started as soon as possible.

CHARGING, STEMMING, AND FIRING

The methods of charging, stemming, and firing were very similar in all the tunnels studied. Where there were differences they were due to the stricter regulations applied to British colliery tunnels by the Coal Mines (Explosives) Order, 1951. For example, in the hydro-electric tunnels charging could start during drilling.

In the NCB tunnels sheathed or unsheathed permitted explosives (usually Polar Ajax) were used. Gelignite sometimes with dynamite was used in the hydro-electric tunnels and in the German tunnel. Stemming was with sand in bags, clay, stone-dust-and-water paste, or by hurricane stemming in NCB tunnels. In hydro-electric tunnels sand in bags was used and clay in Germany. In NCB tunnels the wedge cut is mainly used. The burn cut is gaining popularity and there are tunnels where the cone or fan cuts are used. The burn cut was used in all the hydro-electric tunnels and the wedge cut in the German tunnels.

Table 4 summarizes the times of charging, stemming, and firing in the tunnels.

TABLE 4.—*Summary of Charging, Stemming, and Firing Times.*

—	NCB min.	Hydro-electric min.	German min.
Clearing out holes (time after drilling has been completed) ..	5	1	7
Charging and stemming	22 to 64	12 to 33	52
Connecting up	6	2	7
Clearing away	negligible	1	
Moving to safety	3	4	4
Testing circuit and firing	3	2	
Waiting for fumes to clear ..	6	8	18
Delays due to faulty connections..	2	3	
Returning to face	4	4	4

Comparison of the figures for the different environments shows little variation. Where differences do occur they are either due to the differences in regulations (*e.g.*, the shorter hole cleaning-out time in hydro-electric tunnels, due to overlapping 3 min. of the drilling time) or to the number and length of holes charged. From the studies of charging and stemming in NCB and hydro-electric tunnels the following relationship for the time of charging and stemming (when using sand-in-bags stemming) has been found:

$$\text{Time of charging and stemming (min.)} = 0.6 \times \frac{\text{number of holes} \times \text{average length of holes (ft.)}}{\text{number of men in crew}}$$

Table 5 gives the estimated times for this part of the cycle in NCB tunnels according to the number of men usefully employed on the work. As an example the figures for medium strata are plotted in Fig 13. For softer strata the times are less than for harder strata, due to the different

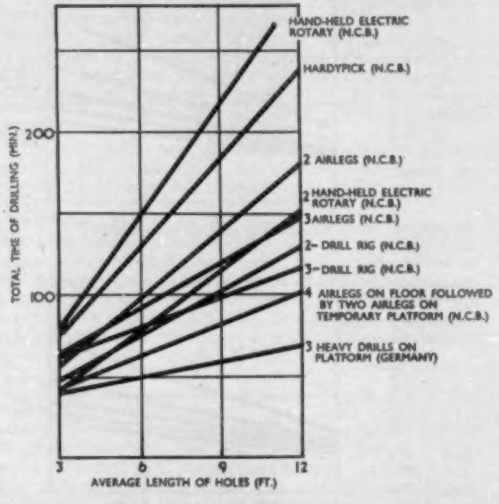


FIG. 11.—ESTIMATED DRILLING TIMES IN SOFT COAL-MEASURE STRATA FOR 12-FT. BY 9-FT. TUNNELS.

numbers of holes necessary. The figures given are based on:—

(i) the formula:

Number of holes $= 37.5 + 0.130A - 1.15H$

Where A = excavated area in sq. ft. and H is 10 for "hard," 15 for "medium" and 20 for "soft" strata.

This formula has been derived from a statistical analysis of the firing patterns for a sample of 41 NCB tunnels.

(ii) the formula:

Time of charging, stemming, and firing

$$= 33 + 0.6 \times \text{number of holes} \times \frac{\text{average length of holes (ft.)}}{\text{number of men in crew}}$$

Selection and Design of Firing Pattern

Some difficulty has been experienced in NCB tunnels with the burn cut in keeping previous arches in position. Where the burn cut is successful, arches are either tied strongly or the pattern has been designed so as to avoid this difficulty. With the burn cut more holes are needed to fire the face and more explosive may be used than with the wedge cut. No other disadvantages of the burn cut were suggested during the studies. The main advantages claimed are that it enables a longer pull to be obtained relative to the hole depth (this was proved at one of the hydro-electric tunnels, but may not be so in strongly bedded strata), and that it facilitates the use of more drills for drilling. Experiments should be made to decide which pattern is more suitable under various conditions in NCB tunnels.

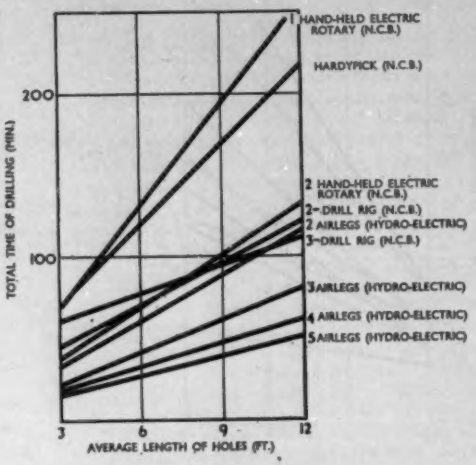


FIG. 12.—ESTIMATED DRILLING TIMES IN SOFT COAL-MEASURE STRATA FOR 10-FT. BY 8-FT. TUNNELS.

The pattern should be designed with the following aims:—

(1) To blast away the rock over a cross-sectional area sufficient to allow arch setting without the need for much scaling or extra "pop-holes." Undercharging of the round can lead to slower rates of advance due to time of scaling and firing extra shots; (2) to give fragmentation suitable for rapid loading with the loader selected; (3) to limit the throw of the dirt pile, so that loading can be

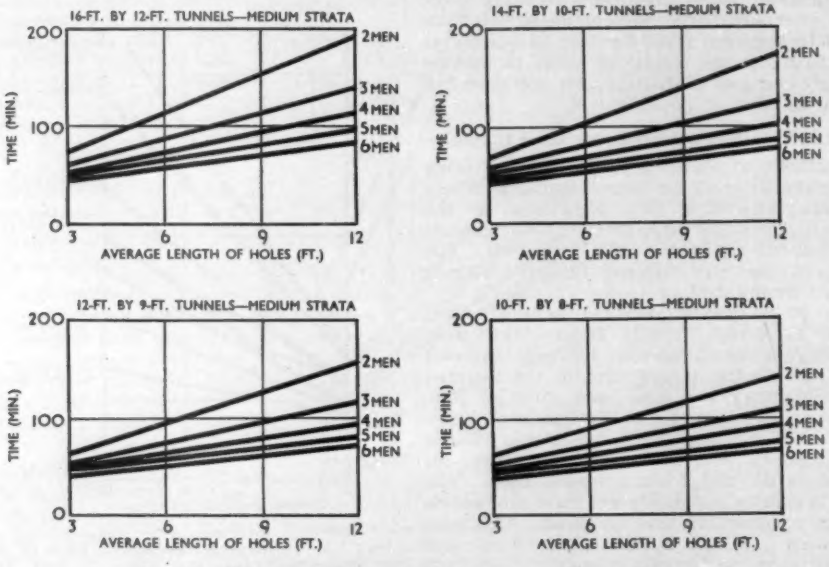


FIG. 13.—ESTIMATED CHARGING, STEMMING, AND FIRING TIMES.

TABLE 5.—*Estimated Charging, Stemming, and Firing Times.*

Size of arches.	Time (min.)			
	3-ft. holes	6-ft. holes.	9-ft. holes.	12-ft. holes.
Hard Strata				
16 ft. by 12 ft...	33+92/M	33+184/M	33+275/M	33+367/M
14 ft. by 10 ft...	33+81/M	33+162/M	33+243/M	33+324/M
12 ft. by 9 ft. ..	33+74/M	33+148/M	33+221/M	33+295/M
10 ft. by 8 ft. ..	33+67/M	33+133/M	33+200/M	33+266/M
Medium Strata				
16 ft. by 12 ft...	33+81/M	33+162/M	33+243/M	33+324/M
14 ft. by 10 ft...	33+70/M	33+140/M	33+211/M	33+281/M
12 ft. by 9 ft. ..	33+63/M	33+126/M	33+189/M	33+252/M
10 ft. by 8 ft. ..	33+58/M	33+115/M	33+173/M	33+230/M
Soft Strata				
16 ft. by 12 ft...	33+72/M	33+144/M	33+216/M	33+288/M
14 ft. by 10 ft...	33+61/M	33+122/M	33+184/M	33+245/M
12 ft. by 9 ft. ..	33+54/M	33+108/M	33+162/M	33+216/M
10 ft. by 8 ft. ..	33+49/M	33+ 97/M	33+146/M	33+194/M

"M" is the number of men usually employed on the charging and stemming part of the work at the face of the tunnel.

rapid and so that tub crossings, compressed-air piping, etc., can be kept near to the face without damage or inconvenience; (4) to give as long a pull as possible with the length of holes used; and (5) to blast the face to allow loading as soon as possible. Therefore, wherever permissible, the face should be fired in one round.

Savings in cost of explosives should always be only a minor aim. In tunnels where maximum rates of advance are necessary, a reduction in the explosives used should only be made if the attainment of the above aims is not affected. In tunnels where the most economical drivage is desired, the effect of reductions in explosives used per round should be considered against any increased overall cost due to shorter pull, time of the cycle, etc.

Organization of the Work

The regulations for British coal mines do not allow charging by the face crew unless they are qualified shotfirers. Although the face men can help the shotfirers by doing most of the stemming of the holes, a larger face crew would be partially unemployed during this part of the cycle unless more than one shotfirer were available. Therefore, with the present regulations, arrangements should be made for at least two shotfirers to be able to charge at the tunnel face where large crews are necessary to attain the maximum rates of advance.

The "sand-in-bags" method of stemming is normally faster than either hurricane stemming or stemming with clay or stone-dust-and-water paste. However, if used efficiently (*e.g.*, by reducing the time spent by the face crew in supplying chippings to the stemmer) hurricane stemming may prove faster than the other two.

During the studies, delays were caused by the firing cable being short-circuited due to hanging in places where it is easily damaged. Special insulated hangers would reduce these delays.

The figures given in Table 5 are for tunnels with normal NCB type ventilation. These times can be reduced by about 5 min. by improving the clearance of firing fumes. Where records for fast tunnelling have been established, one or more of the following methods of rapidly clearing the fumes have been used. (1) Increasing the ventilation flow to 7,500 cub. ft./min. in a hydro-electric tunnel of 52 sq. ft. cross sectional area; (2) blowing compressed air from the face end of the compressed-air piping; and (3) blowing a mixture of compressed air and water, sprayed out with a jet mounted on the water pipe and connected to the air line. Only the first and last of these methods are permissible in NCB tunnels.

HEAT PROTECTION OF TIMBER

A PROCEDURE is described by E. T. Linacre in SMRE Research Report No. 178 for assessing the heat-protection conferred on timber by compounds of sodium silicate, limestone dust, and sand, in conditions resembling those in a large mine-roadway fire. The timber was exposed for 5 min. to a radiant panel transferring to a water-cooled metal-tube calorimeter at about 0.9 cal/sq. cm./sec., approximately the same as the 1 cal/sq. cm./sec. transferred to the calorimeter in a fire of 2½ tons of wood burning at a rate of about 20 cwt./hr. in a ventilated tunnel.

The heat protection provided was little affected by omitting the sand from the coating compound or varying the amount of moisture in the timber and the coating.

The layer flaked off the timber, leaving it vulnerable to ignition, if the silicate was of a grade with a low silica content and had been exposed for a few weeks to a high atmospheric relative humidity. A coating provided useful protection of specimen boards in an experimental fire, though untreated wood surfaces were severely charred; a coating also retarded ignition of timber by radiant heat and a pilot jet.

Simple guide to Steel

Third in the series of simple guides produced by the British Iron and Steel Federation, "A Simple Guide to the Structure and Properties of Steel," is now available, free of charge. The first two booklets dealt, respectively, with basic and finishing processes. Although it is hoped that the latest publication will prove useful in its own right, it is also intended to supplement the three films on the structure and properties of steel produced by the federation in 1957.

FORTHCOMING EVENTS

MARCH 28

Institution of Electrical Engineers (East Anglian Sub-centre): Meeting at the Assembly House, Norwich, at 7.30 p.m.: "Submersible Pumping Plant," by H. H. Anderson and W. G. Crawford.

North Staffordshire Institute of Mining Engineers: Meeting at the North Staffs Technical College (Room C2) at 5.30 p.m. "Investigations into the Behaviour of Rocks Under Pressure by using Sonics," by Dr. B. Singh and Prof. E. L. J. Potts.

MARCH 29

South Staffordshire and Warwickshire Institute of Mining Engineers: Meeting at the Swan Hotel, Lichfield, at 3 p.m. "Stress Analysis Applied to Mine Haulage Suspension and Roof Support Equipment," by Dr. E. M. Loxley, principal scientific officer, Safety in Mines Research Establishment.

MARCH 30

Institute of Metals: Meeting at the Hoare Memorial Hall, Great Smith Street, London, S.W.1, at 2.30 p.m.: "New Aspects of the Electron Theory of Metals" (an educational session).

MARCH 31

Institution of Plant Engineers (North East Branch): Meeting at the Three Tuns Hotel, Durham, at 7 p.m.: "Type and Application of Plant for Open-cast Coal Extraction," by H. Briggs.

North of England Institute of Mining and Mechanical Engineers: Meeting at the institute, Neville Hall, Newcastle-upon-Tyne, at 2.30 p.m.: "Civil Engineering Applied to Colliery Reconstruction," by J. Mitchell.

APRIL 5

Institution of Electrical Engineers (East Midland Centre): Meeting at Portland Building, The University, Nottingham, at 6.30 p.m.: "Submersible Pumping Plant," by H. H. Anderson and W. G. Crawford.

Institution of Plant Engineers: General meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m.: "Large Span Bridges with Special Relation to the Runcorn-Widnes Project," by J. Kenneth Anderson.

APRIL 5-8

Battersea College of Technology Metallurgical Department: A refresher course, including lectures and discussions covering "The Structure of Metals and Alloys," directed by A. P. Miodownik and J. Mackowiak.

APRIL 6

Combustion Engineering Association (Southern Region): Meeting in London: "The Advantages and Economics to be Derived from Automatic Control on Boiler Plants from 10,000 lb./hr. up to 50,000 lb./hr."

APRIL 6-7

Iron and Steel Institute (Iron and Steel Engineers Group): Meeting at 4, Grosvenor Gardens, London, S.W.1. Four papers on the design and operation of heavy plate mills and their auxiliary equipment.

APRIL 7

Manchester Geological and Mining Society: Meeting at Wigan and District Mining and Technical College, at 4 p.m.: "Hydraulics on Armoured Flexible Conveyors," by C. L. Goddard.

APRIL 13

Midland Counties Institution of Engineers: Meeting at the University, University Park, Nottingham: "Mining Subsidence," by L. H. Spencer.

Institution of Electrical Engineers (North Lancashire Sub-Centre): Meeting at the NWEB Lecture Theatre, Jubilee Street, Blackburn, at 7.15 p.m.: "Development of High-voltage Air-break Circuit-breakers with Insulated-Steel-Plate Arc-chutes," by F. S. Fay, J. A. Thomas, D. Legg, and J. S. Morton.

APRIL 14

Combustion Engineering Association (Midland Region): Meeting at the Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham 2, at 10.15 a.m. "Industrial Space Heating," by F. R. Colton.

APRIL 22

Institution of Civil Engineers: Visit to the civil engineering works of the National Coal Board in the Neath Area, followed by "Surface Reorganization of a Group of Collieries," by G. A. Jones, at the Town Hall, Neath.

APRIL 23

Institution of Production Engineers (North Midlands Region): One-day conference at the Welfare Hall, Rolls-Royce Limited, Derby, at 9.30 a.m.: "The Production Engineer in a Changing Economy."

APRIL 25-29

Compressed Air and Hydraulics Exhibition and Conference: Empire Hall, Olympia, London, W.14.

APRIL 26

Combustion Engineering Association (Scottish Region): Meeting at Galashiels. "Coal to Oil Conversion" and "Utilization of Small Coals."

APRIL 27-MAY 6

Fuel Efficiency and Power for Industry Exhibition: Grand Hall, Olympia, London, W.14.

APRIL 28

Coke Oven Managers' Association (Northern Section): Joint meeting with the Institution of Gas Engineers (North of England Section) at the Three Tuns Hotel, Durham, at 7 p.m. "Centralized Control in a Modern Coke-oven Plant," by M. D. Edington and H. Milliner.

Combustion Engineering Association (Western Region): Visit to Albion Colliery, Abercynon, followed by a meeting in Cardiff ("Work of British Coal Utilization Research Association").

National Association of Colliery Managers

APRIL 2

Midland Branch: Annual dinner-dance at the Sherwood Rooms, Nottingham; reception at 7 p.m.

APRIL 11

Midland Branch: Meeting at the Mines Rescue Station, Leeming Lane, Mansfield, at 6.30 p.m.: Paper by H. Wright.

APRIL 12

Yorkshire Branch: Annual general meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m.

APRIL 29

Kent Branch: Annual dinner-dance at the County Hotel, Canterbury; reception at 7.30 p.m.

New Catalogues, etc.

THE following new catalogues, booklets, etc., have been received and are acknowledged with thanks.

JELTEK, LIMITED, Hounslow (Middx)—Leaflet featuring Hydex protective clothing.

JOY-SULLIVAN, LIMITED, London, W.1—Brochure with information of several types of Joy Speedline Rock-drills.

W. T. AVERY, LIMITED, Birmingham—Spiral-bound brochure reviewing various products manufactured by the company.

WOODSIDE DIE SINKING COMPANY, LIMITED, Leeds—Leaflet dealing with five types of torque screws, showing sizes and dimensions.

S. SMITH & SONS (ENGLAND), LIMITED, London, N.W.2—Colourful brochure reviewing the activities and organization of the company.

SUFFOLK IRON FOUNDRY (1920), LIMITED, Stowmarket—Specification list No. 91259C dealing with Sifbronze oxy-acetylene welding products.

AUTOMATIC TELEPHONE & ELECTRIC COMPANY, LIMITED, London, W.C.2—Leaflet reviewing the ATE shaft-signalling system, type 57.

JAMES DOUGALL & SONS, LIMITED, Bonnybridge, Scotland—Pamphlet dealing with various types of refractories manufactured by the company.

MACKAY INDUSTRIAL EQUIPMENT, LIMITED, Feltham (Middx)—Two brochures dealing with the Allis-Chalmers HD 21 and HD 16 crawler tractors.

ROCOL, LIMITED, London, W.C.2—Brochure covering the applications and uses of molybdenum disulphide lubrication, including tables and general data.

MATBRO, LIMITED, Horley (Surrey)—Leaflet covering the Matbro Mastiff, the first British four-wheel drive and steer-loading shovel exported to North America.

WOODALL-DUCKHAM CONSTRUCTION COMPANY, LIMITED, London, S.W.3—Brochure illustrating Sarco firebricks and Sarco refractory cements, products of the Stourbridge Refractories Company, Limited, Brierley Hill (Staffs), a member of the Woodall-Duckham group.

Converter Plant at

KRIVOI ROG STEELWORKS

STEELMAKING WITH TOP-BLOWN OXYGEN

The top-blown basic-Bessemer plant at the Krivoi Rog iron and steel works in Russia consists of two large converters of 11 ft. 6 in. internal diameter, each fed from above with pure oxygen. The general installation and steelmaking technique have been described by S. G. Afanas'ev and G. N. Kozin in Metallurg, 1959 (No. 11).

CONVERTER plant at the Krivoi Rog iron and steel works is planned for the top blowing of pig-iron with pure oxygen through a special water-cooled lance. The two converters installed are each of 1,554 cub. ft. capacity having the following dimensions:—Internal diameter, 11 ft. 6 in.; height from bottom to lower lip of mouth, 17 ft. 6 in.; internal diameter of mouth, 6 ft.; overall thickness of lining, 18 to 20 [illegible]. The lining is completed in magnesite-chromite [illegible]kwork. Hot metal is poured into the converter fr[illegible] a ladle placed on a transfer car (Fig. 1) delivery [illegible]d pouring of the metal into the vessel being done by remote control.

In the shop two 1[illegible]00-ton mixers are installed. There are two hot-metal cranes of 125/30 tons capacity and a machine to fettle slag from the ladles. There is also a device for the recovery of graphite, liberated during pouring the hot metal from the mixer and during ladle fettling.

Storage of Converter Additions and Charging

Ore, limestone, bauxite, and ferro-manganese are kept in a covered stockyard equipped with two 10-ton magnetic grab cranes, with grabs of 53 cub. ft. capacity. In the lime-burning shop are installed four gas-fired shaft kilns of about 5,000 cub. ft. capacity. The burnt limestone is passed into the screening section, after which it is loaded into skips

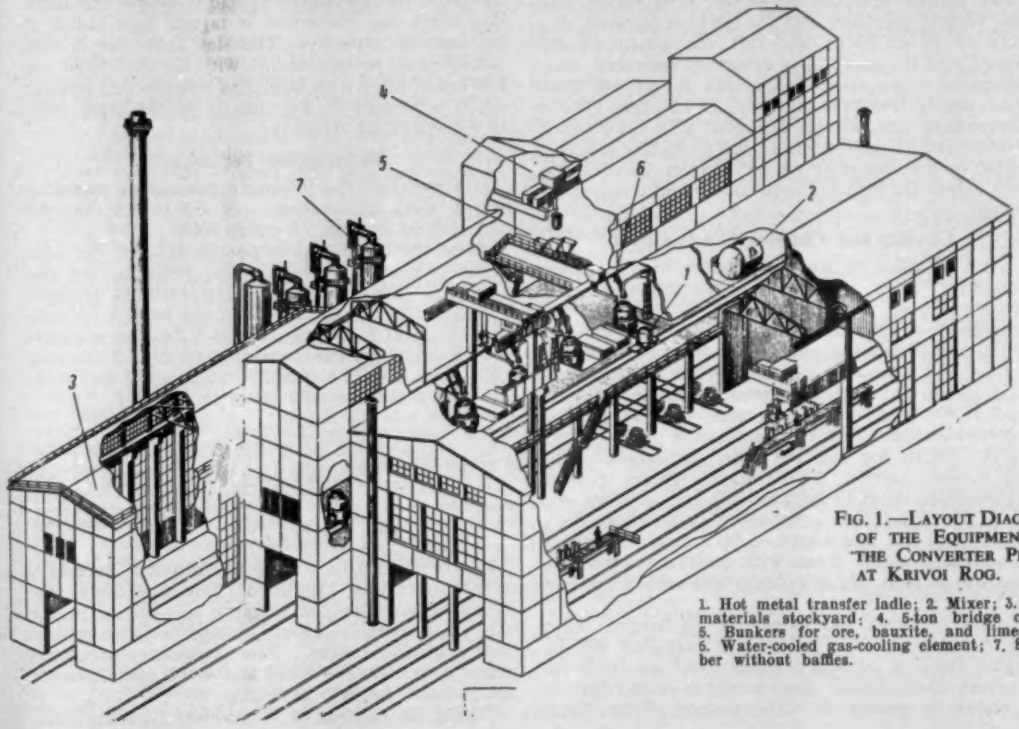


FIG. 1.—LAYOUT DIAGRAM OF THE EQUIPMENT IN THE CONVERTER PLANT AT KRIVOI ROG.

1. Hot metal transfer ladle; 2. Mixer; 3. Solid materials stockyard; 4. 5-ton bridge crane; 5. Bunkers for ore, bauxite, and limestone. 6. Water-cooled gas-cooling element; 7. Scrubber without baffles.

and conveyed to the converter shop. The gases from the lime-burning kilns pass through a gas-cleaning plant and are discharged through a stack to atmosphere.

In order to avoid undue breakage of the limestone on leaving the lime-burning shop, it is loaded into skips of about 123 cub. ft. capacity and transported to the stockyard on flat-platform railway trucks. Here the skips are transferred to a special platform or directly to the 20-ton capacity electric locomotive for delivery to the converters. In the stockyard the ore and bauxite are loaded with the grab crane through an intermediate bunker of about 920 cub. ft. into skips of 70 cub. ft. capacity and delivered to the electric locomotive.

Between the two converters is installed a 5-ton bridge crane, which takes the skips from the electric locomotive and discharges them into burners located at a level of 74 ft. Each converter has three bunkers, one of 530 cub. ft. capacity for ore, one of 780 cub. ft. for limestone, and one of 530 cub. ft. for bauxite. Under the bunkers are belt feeders, which deliver the necessary quantity of material into a weighing hopper for weights up to 5 tons. This hopper has a closure, but when this is opened the material passes down a trough into the converter. The hopper closure is mechanized.

After the solid materials, ore 4.5 per cent., limestone 8 to 9 per cent., and bauxite 0.8 to 1 per cent. have been charged, and the hot metal has been poured into the converter, it is raised into the vertical position, and the lance is lowered at a rate of 10 to 20 in./sec. into the mouth of the vessel. At the same time oxygen is delivered, consumption being about 2,120 cub. ft./ton of steel. The supply line pressure is 8 to 12 atm. Water for cooling the lance is delivered at a pressure of 9 atm. and at the rate of 12,500 to 15,500 gals./hr. Close to the converter on the oxygen delivery line two valves are installed, one cut-off and one control valve.

Cooling and Cleaning Waste Gases

At a distance of 20 in. from the mouth of the converter is a water-cooled waste-gas cooling element, about 9 ft. dia. and 24 ft. long, for the extraction of the liberated gases. This can be withdrawn from the mouth of the converter by means of a special mechanism. The consumption of water in the cooling element is between 62,000 and 87,000 gals./hr. at a pressure of 3 atm. The internal diameter of the gas extraction pipe is about 12 ft. At its top end the gases are diverted into the cooling section of the stack, where sprayed water cools them to between 80 and 100 deg. C. They then pass into a scrubber (without baffles), 16 ft. 6 in. dia. and about 65 ft. high, from which they enter venturi tubes with a drop in pressure equal to a 16-ft. water column and into a cyclone of about 12 ft. dia.

After cleaning, the gases are discharged by a flue-gas exhaust fan into a stack just over 200 ft. high. The dust content is about 0.057 grn./cub. ft., whereas their initial contamination with dust is about 24 g./cub. ft. The output of the flue-gas exhauster is 2,648,000 cub. ft./hr., the pull being equivalent to 47 in. of water column. The capacity of the motor is 500 kVA. The temperature of the gases in the flue-gas exhauster is 35 deg. C. Each converter is equipped with a gas-cleaning plant.

Melting and Casting Arrangements

Charging of each converter as already indicated, is completely mechanized, while tilting it, lowering and raising the lance, and also the operation of the gas-cleaning plant are interlocked, and controlled by an operator. The whole system of interlock and regulation of the delivery of oxygen and water is equipped with a control and measuring device, which not only indicates, but also signals, any reduction in the quality of the oxygen and loss of water pressure. On one of the converters the installation of a waste-heat boiler and an electro-static gas-cleaning plant is planned. In the casting bay there are three railway tracks; on two of these are located four casting platforms with stands for casting the metal. The bay is equipped with four casting cranes of 75/15 tons capacity.

Metal from the converter is poured into a steel casting ladle, seated on an electrically driven car, the movement of the car being controlled from a pulpit located under the working platform. The casting cranes deliver the ladles of metal to the casting stands, and by means of a shunting engine the ingot mould cars are placed below the ladle. Slag from the converters is tapped into ladles of 388 cub. ft. capacity. The slag ladle car is connected by an automatic link with the steel ladle car. The ladles filled with slag pass into the slag section, which is located in the vicinity of the main body of the converter building.

Steelmaking Technique

Hot metal of the following percentage composition is used for blowing:—Si 0.5 to 0.8; Mn 1.0 to 1.4; S up to 0.055; P up to 0.12.

After the hot metal is poured into it, the converter is placed in the vertical position, ore and limestone being charged along inclined troughs. The quantity of ore is determined from a calculation aimed at the production of a final temperature of the metal in the converter of not more than 1,630 deg. C. The quantity of ore and limestone is found from the data given in Table 1.

TABLE 1.—*Converter Additions.*

Si content of hot metal, per cent.	0.4	0.5	0.6	0.7	0.8	0.9
Quantity of ore, lb.	3,400	3,700	4,000	4,300	4,600	5,000
Quantity of limestone, lb.	4,000	4,300	4,500	5,000	5,200	5,400

For every 220 lb. of ore charged it is necessary to add a further 110 lb. of limestone above the indicated quantity for slagging the silicon in the ore. The metal is blown through a lance with a nozzle of 2¼ in. dia. The oxygen consumption amounts to between 4,250 and 4,700 cub. ft./min., the pressure being 6 to 8 atm.

During the melting of low-carbon rimming steel,

the melt may be conducted without intermediate tapping of the slag. During the melting of killed steels, after a blow of 7 min. the slag is tapped, and limestone is added for the second time; after this, the blow is continued until the necessary carbon content is reached.

In the converter shop at Krivoi Rog steelworks carbon steels are melted. On the basis of the chemical composition, the metal from the converters corresponds to the requirements of GOST 380 to 50 for open-hearth furnace steel. The average nitrogen content is 0.006 per cent.

Converter Repairs, Ingot Mould Treatment, and Equipment

At the end of the converter section are located special stands, for knocking out converter linings, for fitting new ones, and for drying. The delivery of bricks and mortar is mechanized, while drying is by artificial means. The converter vessel is transferred to the stand for repair and back again by a bridge crane of 150/30 tons capacity. The organization of refits at a point remote from the converters in operation made it possible to increase the output of the shop by about 25 per cent. and create favourable conditions both for the work of refitting and for the operation of the converters. In the casting bay are installed two compartment kilns for drying the stoppers, and stands for fitting pouring nozzles and stoppers to the ladles. The kilns and stands are served by two 2.5-ton cantilever cranes.

On completion of casting, after a certain holding period, the cars with the ingots are moved from the casting bay into the ingot stripping section, equipped with two bridge-type stripper cranes of 25/15 tons capacity and a knock-out ram exerting a pressure up to 175 tons. The ingot moulds are cleaned with water from jet sprays, two moulds at a time, at a pressure of 70 atm., and transferred into the section where a stationary machine for mould coating is installed. The ingot-mould yard is equipped with four cranes of 20/5 tons capacity, has four platforms for preparing the cars, and also has three rail tracks.

The oxygen plant in the first instance was planned as a group of three KT-3600 units with the appropriate air and oxygen compressors. At the present time two BR-5 units, each with an oxygen output of 176,000 cub. ft./hr., are being built.

Iron-ore Developments in Mauritania

LOAN equivalent to $66,000,000 for the development of high-grade iron-ore deposits in the Islamic Republic of Mauritania in north-west Africa has been made by the World Bank. Completely new opportunities for economic growth in Mauritania, where the severity of natural conditions narrowly limits expansion of the traditional agriculture and livestock raising, will be opened up by the project. The loan was made to the Société Anonyme des Mines de Fer de Mauritanie (Miferma), a Mauritanian company whose share capital is widely held. Somewhat over half the shares are held by French, British, German, and Italian consumers of iron ore or their representatives, who have signed long-term contracts to purchase at least 3,000,000 tons of ore a year. The remaining shares are held by private French financial interests (20 per cent.) and by an agency of the French Government responsible for mineral exploration and development (27 per cent.).

The bank loan will help to finance equipment and services to mine ore at a rate which would eventually reach 6,000,000 tons a year; construction of a 415-mile railway to transport the ore from the mines near Fort Gouraud to Port Etienne on the Atlantic coast, and construction of port and other facilities.

The iron-ore deposits are located in a low mountain range, known as the Kedia D'Idjil, which rises 1.800 ft. above the Saharan plain near the old military post of Fort Gouraud. Open-pit reserves are estimated to be about 115,000,000 tons with an average shipping grade of 63 per cent.; the ore is similar to high-grade Swedish and South American ores. The ore will be mined by conventional open pit methods and shipped after simple crushing. It will be transported to Port Etienne in long heavy trains, carrying 10,000 tons on a single trip. Facilities to be installed will be capable of loading or unloading a train in three hours. Each train will be made up of about 135 wagons, headed by four 2,000-h.p. diesel-electric locomotives, and will have an average operating speed of 40 m.p.h. The 415-mile railway will be a single track, standard-gauge line with heavy rails welded throughout. It will traverse open desert and the movement of trains will be controlled by radio.

The main bay on which Port Etienne is located is well protected and has deep-water close inshore. The new port facilities will provide berthage for ships of up to 60,000 d.w. tons. Storage will be provided for the stockpiling of about 650 000 tons of ore so that shipments can be maintained during the four hottest months of the year when mining operations will be cut 50 per cent. The initial capacity of facilities for loading ships will be 3.000 tons an hour, with provision for an increase to 6,000 tons.

Tin Research Developments

SEVERAL new lines of investigation in metallurgy, tinplate, electrodeposition, and in organotin chemistry are mentioned in the annual report of the Tin Research Institute. In the metallurgical field, systematic investigations are continuing into the alloys of tin with the newer metals, titanium, zirconium, and niobium. The effects of tin in cast iron and in steels are being further studied and practical trials are being made with cast irons containing prescribed additions of tin. Bright deposits of tin can be made by electrodeposition using wood tar additions in the plating vat. The institute is trying to discover which constituents of the tars are effective so that the process can be simplified.

Several new studies of the properties of tinplate are referred to in the report, while a new method of assessing porosity of tin coatings by measurement of flow of current is described. Organotin researches are pointing the way to new types of compounds of greater complexity which are likely to have industrial uses.

Pig-iron and Steel Production

STATISTICAL SUMMARY

IN the following United Kingdom pig-iron and steel statistics, issued jointly by the Iron and Steel Board and the British Iron and Steel Federation, Table 1 gives the production of pig-iron and ferro-alloys and the number of furnaces in blast in January. Table 2 gives the production of steel ingots and castings in January and Table 3 gives details of deliveries of finished steel in December last. Activities of the industry are summarized in Table 4.

TABLE 1.—*Average Weekly Production of Pig-iron and Ferro-alloys in January, 1960.* (*Thousands of Tons.*)

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derbys, Leics, Notts, Northants, and Essex	18	—	24.8	22.7	0.3	—	47.8
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	6	—	21.4	—	—	0.9	22.3
Yorks (excl. N.-E. Coast and Sheffield)	—	—	—	—	—	—	—
Lincs	10	—	47.3	—	—	—	47.3
North-East Coast	16	2.1	62.3	—	—	—	64.4
Scotland	5	0.1	17.0	1.3	—	—	18.4
Staffs, Shrops, Worcs, and Warwicks	5	—	9.3	1.0	—	—	10.3
S. Wales and Monmouthshire	11	3.4	60.2	—	—	—	63.6
Sheffield	2	—	3.1	—	—	—	3.1
North-West Coast	8	16.5	1.2	1.3	—	1.3	20.3
Total	81	22.1	246.6	26.3	0.3	2.2	297.5
December, 1959*	81	21.0	230.8	25.7	0.8	2.1	280.4
January, 1959	84	19.2	183.7	23.5	0.1	2.2	228.7

TABLE 3.—*Average Weekly Deliveries of New Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1958.	1959.	1958. Dec.*	1959. Nov.	1959. Dec.*
Non-alloy steel:					
Ingots, blooms, billets, and slabs‡	4.6	5.1	6.3	6.6	5.1
Heavy rails	10.2	6.8	8.4	6.2	6.9
Sleepers	1.2	0.6	2.0	0.2	0.2
Fishplates and soleplates	0.7	0.4	0.3	0.2	0.4
Plates:					
(i) Over ⅜ in.	29.6	24.8	22.2	28.7	26.5
(ii) Under ⅜ in.	17.7	18.3	14.9	20.7	18.3
Other heavy prods.	41.8	41.2	26.4	53.9	48.8
Ferro-concrete bars	7.6	9.6	6.3	12.2	10.0
Wire rod	21.5	23.5	20.5	28.0	25.5
Arches, etc.	8.6	7.8	6.2	7.3	6.4
Other light sections	29.1	33.0	25.7	40.8	38.9
Bright steel bars	6.2	7.6	5.5	9.4	8.5
Hot-rolled strip	22.6	27.4	20.7	32.9	28.7
Cold-rolled strip	7.0	8.0	6.3	9.9	8.9
Sheets, incl. coated:					
(i) Hot rolled	10.6	11.8	8.7	13.8	12.1
(ii) Cold reduced	31.1	35.2	30.8	38.4	34.8
Tinplate:					
(i) Hot dipped	8.4	7.7	8.2	8.8	8.5
(ii) Electrolytic	10.3	13.2	10.9	14.7	13.8
Blackplate	0.8	0.7	0.7	0.9	0.7
Tubes up to 16 in.	19.0	20.6	17.2	26.2	22.1
Tube fittings, etc.	0.4	0.4	0.3	0.5	0.4
Tyres, wheels, and axles	4.5	2.4	3.1	3.3	2.0
Forgings (excl. drop)	2.6	2.1	2.1	2.3	1.9
Steel castings	4.2	3.6	3.3	4.1	3.7
Tool steel, etc.	0.2	0.2	0.2	0.3	0.2
Total	300.5	312.0	257.2	370.3	333.3
Alloy steel	16.1	18.2	13.5	22.7	19.5
Total deliveries from UK production†	316.6	330.2	270.7	393.0	352.8
Add: Imported finished steel	7.0	7.1	3.6	9.6	8.1
	323.6	337.3	274.3	402.6	360.9
Deduct: Intra-industry conversion§	41.2	47.6	36.0	55.8	49.2
Total new material	282.4	289.7	238.3	346.8	311.7

† Includes finished steels made from imported ingots and semis.
‡ Other than for conversion into any other form of steel listed.
§ Material for conversion into other products also listed in this table.

TABLE 2.—*Average Weekly Production of Steel Ingots and Castings in January, 1960.* (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derbys., Leics., Notts., Northants, and Essex	—	4.8	17.0 (basic)	2.6	0.1	22.9	1.6	24.5
Lancs. (excl. N.-W. Coast), Denbighs., Flints., and Ches.	0.8	39.6	—	4.8	0.4	44.2	1.4	45.6
Yorkshire (excl. N.-E. Coast and Sheffield)								
Lincs.	—	52.7	—	—	0.1	52.7	0.1	52.8
North-East Coast	1.0	92.6	—	1.4	0.4	93.5	1.9	95.4
Scotland	1.4	44.6	—	2.8	—	46.9	1.9	48.8
Staffs., Shrops., Worcs., and Warwicks.	—	23.6	—	4.3	0.8	26.8	1.9	28.7
S. Wales and Monmouthshire	1.9	92.9	14.5 (basic)	0.9	0.1	109.9	0.4	110.3
Sheffield (incl. small tonnage in Manchester)	7.5	35.8	—	14.5	0.3	56.2	1.9	58.1
North-West Coast	—	—	6.4 (acid)	0.8	—	7.1	0.1	7.2
Total	12.6	386.6	37.9	32.1	2.2	460.2	11.2	471.4
December, 1959*	11.2	354.7	36.4	28.6	2.0	422.6	10.3	432.9
January, 1959	11.4	296.5	24.5	22.5	2.0	347.6	9.3	356.9

TABLE 4.—*Iron and Steel Index and General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period.	B.o.T. Price Index, 1938 = 100. Iron and steel.	Coal.	Basic materials§	Iron-ore output.	Imported ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy). Imports.†	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.‡
1957	328	488	537	325	303	270	275	220	14	417	322	2,580
1958	343	403	478	276	262	227	245	196	9	369	284	2,242
1959	340	497	477	286	244	210	242	208	7	388	291	2,244
1960—Jan.	339	503	489	322	306	255	298	245	11	471	354	2,247

* Months contain five weeks, all tables. ‡ Stocks, ingots, semi-finished and finished steel, at the end of the years and months shown.
† Weekly average of calendar month. § Used in non-food manufacturing industries.

Development in Dust-Suppression Equipment

NEW DESIGN OF WATER-CONTROL VALVE

IN recent years mining engineers have paid increasing attention to the control of dust from underground and surface plant. This increasing awareness of the need for dust suppression has introduced additional problems, mainly associated with the control of water, or dust allaying medium. Often water is scarce, making it necessary to conserve its use. In addition, the inefficient application of water has led to operational difficulties and needless damage to conveyor belt and ancillary equipment.

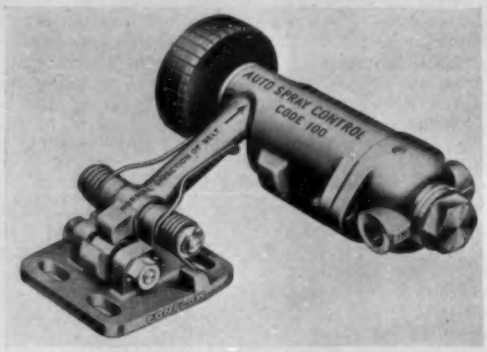


FIG. 1.—CONFLOW CODE 100 AUTO SPRAY CONTROL UNIT.

For several years, Conflow, Limited, Lenton, Nottingham, has been associated with the problems of the control of water for the suppression of dust, both in mines and in other industries with similar problems. The culmination of this work has led to the introduction of the Conflow code 100 auto spray control unit (Fig. 1). The purpose of this unit is to control automatically supplies of water sprayed or sprinkled on to transported materials so that water is consistently applied while loads are moving.

The basis of this system of control of liquid is a valve, which is operated by a small rotary oil pump, integral with the unit. Rotation is imparted to a grooved driving wheel by the deflection of the top carrying belt in conveyor installations, and in other applications by moving trucks, cables, rotary plant, and shafts.

Thus, supplies of independent power to this unit are unnecessary. Rotation of the driving wheel in the direction of the arrow indicated on the unit drives a gear pump, which delivers a special hydraulic fluid at low pressure from a reservoir to the rear of the piston which moves forward, carrying with it a push-rod, thus lifting the control valve from its seat, permitting water or other liquid to flow through the unit to the spray-pipe line. Cessation of the rotary motion causes the spring-loaded control valve to close. The valve section is integral with the unit, so that water or liquid cools the hydraulic fluid. Isolation of the water from the hydraulic fluid is effected by two seals, through which the push-rod slides. A drain port is situated between these two seals so that wear can be detected on the seals by the leakage of hydraulic fluid on water.

The standard auto spray unit controls water or liquids with flow pressures from 10 to 1,500 lb./sq. in., and the viscosity of the fluid remains practically constant in ambient working temperatures from 40 deg. F. to 140 deg. F.

On conveyor installation the unit is sited beneath the top conveyor belt (as shown in Fig. 2) midway between two sets of conveyor rollers and central

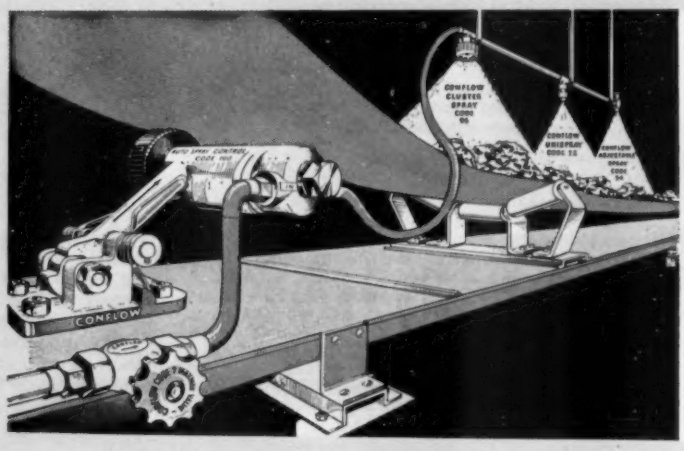


FIG. 2.—SPRAY UNIT, DRIVEN BY BELT DEFLECTION, SITED BENEATH THE TOP CONVEYOR BELT.

with the width of the belt, where maximum deflection takes place. The control valve is attached to its base by a spring-loaded arm so that the elevation of the unit with respect to the moving conveyor belt can be adjusted. In fixing, the unit is adjusted to just avoid contact between the driving wheel and an empty running belt. The slightest deflection of the moving belt causes the driving wheel of the unit to rotate and the valve to open. The elevation of the control valve can be adjusted from either side of the belt by the application of a box spanner.

Outlet hoses can be brought from either side of the conveyor and connected to the unit. The sprays over the belt are sited no more than 6 ft. outbye of the unit. This distance is specified so that oncoming

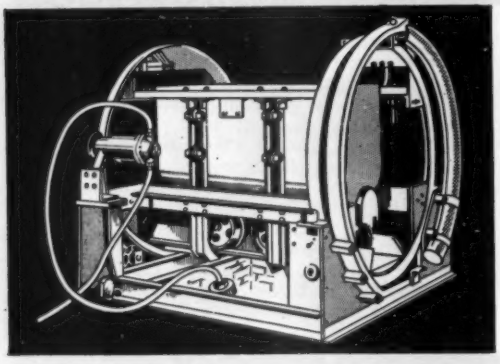


FIG. 3.—AUTOMATIC SPRAY UNIT FITTED TO A ROTARY TIPPLER.

loads only are sprayed, avoiding application of water on to an empty belt.

For use with tipplers (Fig. 3), the spray control valve is fitted to contact the periphery of the tippler drum as it commences to rotate in the unloading direction and to permit water to pass to the correctly sited sprays at the same time. Cessation of rotation or reversal causes spraying to cease.

The quick action of the control valve has made it possible to spray the contents of moving mine cars, and to cease spraying when the end of the mine car is reached. The units are fitted so that the operating wheel is rotated by the passage of the mine car or pit tub.

Ironfoundry Handbook

This is the first edition of this handbook, which contains technical information on the foundry industry intended to assist designers and manufacturers using castings. It provides a guide to the facilities, capabilities, and capacities of individual foundries, enabling users to contact a suitable foundry for specific types of work, and includes a buyers' guide for various types of foundry equipment and materials. The price is 42s. a copy, and the handbook, which is published by the Standard Catalogue Company, Limited, 26, Bloomsbury Way, Holborn, London, W.C.1, will appear in alternate years.

New Mining Block at Cardiff

CONSTRUCTION of the second half of the new Mining Department block at the University College of South Wales and Monmouthshire, Cardiff, was commenced in 1957 and completed at the end of last year. The new building was officially opened by the Duke of Edinburgh on March 11. The Duke is Chancellor of the University of Wales. The first half of the new block was occupied at the end of 1955.

With the opening of the final section, the Mining Department now has a main lecture theatre, lecture rooms, together with extensive research and demonstration laboratories. The basement rooms comprise an extension to the workshop, a heavy research laboratory, a flotation and filtration laboratory for mineral preparation, an extension to the general mining laboratory, and a store room.

An Expanding Coalfield

The Mining Department of the University College of South Wales and Monmouthshire was founded in 1891 to provide facilities in Wales for the training of mining engineers to university standards concurrently with allied sciences, economics, and industrial relations. The education of mining engineers in the South Wales coalfield is of vital importance to its future. The recent recession in the coal industry which led to the revised plan being put forward by the National Coal Board last October will have practically no effect on the planned future expansion of the field, which is situated in a highly industrialized area and is conveniently placed and equipped for the export of coal.

The NCB intends to spend £84,000,000 during the next five years in South Wales and the target output for 1965 is 24,000,000 to 26,000,000 tons, compared with an actual output of 21,200,000 tons in 1959. The manpower to be employed in 1965 is estimated at 90,000 to 94,000; it was 90,000 in 1959. In order to achieve the increase in productivity that these figures envisage many of the producing collieries in 1965 will be either new or reconstructed pits. In addition, the coalfield still has a backlog in places of bad industrial relations and technical stagnation which it is the function of education to redress. To this end the new Mining Department intends and is equipped to play its full part.

Since its inception the department has taken an important part in the investigation of the coalfield's technical and safety problems. From the days of its first professor, Sir William Galloway, the department has always taken a leading part in the investigation of the problems of coal dust in mines. Facilities for research into these and many other problems have been greatly enhanced in the new building and a research team is carrying out work on a number of current problems.

Some of the technical factors in the production of iron by methods other than the blast furnace were discussed in a paper which Dr. J. Taylor presented at a meeting of the West of Scotland Iron and Steel Institute last Friday. The conditions necessary for the efficient separation of iron from the gangue produced in the reduction of iron oxide are first considered, followed by a review of the alternatives to the blast furnace involving the production of solid iron by gaseous reduction or by reduction with solid carbon, or the production of liquid iron. Each of these is examined for advantages and disadvantages, and it is concluded that in normal circumstances no other process is as yet so efficient as the blast furnace.

METHODS OF PIG-IRON PRODUCTION

Alternatives to the Blast Furnace

THERE has been a growth of interest over the last 20 years in methods for the production of iron other than the blast furnace. The array of new processes is now so extensive and the claims made so sweeping that it is difficult to keep in touch with the literature and still more to attempt to assess each new process on its merits. Even though the economics may be largely governed by local factors, a technical evaluation must be made first. In this paper an attempt is made to formulate basic technical factors which many of the processes have in common.

The primary aim in ironmaking is to reduce iron oxide to iron and to separate the iron from the accompanying gangue. For economic reasons one is restricted to carbon and hydrogen in various forms for the reducing agent. Consider first the gaseous reduction of iron oxide by carbon monoxide or hydrogen. The equilibrium gas compositions for the reduction of FeO are as shown in Table 1.

TABLE 1.—*Equilibrium Gas Ratios for Reactions.*

Temp. deg.C.	$FeO+CO=Fe+CO_2$ pCO/pCO_2	$FeO+H_2=Fe+H_2O$ pH_2/pH_2O	$C+CO_2=2CO$ pCO/pCO_2	$C+H_2O=CO+H_2$ pH_2/pH_2O
300	0.15	6.3	—	—
500	0.53	3.1	—	—
700	1.1	2.0	—	—
900	1.8	1.5	5	5
1,200	2.9	1.2	30	22
1,500	4.8	1.2	100	55

These figures illustrate that CO/CO_2 ratios increase with increasing temperature, while H_2/H_2O ratios decrease. Below about 850 deg. C., CO is potentially more efficient that H_2 as a reducing agent for iron oxide, while above 850 deg. C. the reverse is so. In the presence of solid carbon the $C\text{-}CO_2$ and $C\text{-}H_2O$ reactions become the controlling factor above about 900 deg. C., and, as shown in Table 1, the CO/CO_2 and H_2/H_2O ratios then become very large.

While in any industrial process the equilibrium in a reaction is an essential first criterion, the rate at which equilibrium is approached is frequently a more important limiting factor in practice. Like all chemical reactions the specific reaction rate for the reduction of iron oxide increases with temperature. However, once sintering and glazing of the solid surface begins, which may be at temperatures as low as 700 deg. C., it exercises a retarding effect on the reaction because of poorer gas/solid contact. The result is that the rate of gaseous reduction reaches a maximum at 850 deg. C., and then rapidly declines.

An important point to be borne in mind is that the rate also diminishes with decreasing oxygen content so that, even at the maximum, removal of the final 3 to 4 per cent. of oxygen is slow. Complete reduction of iron oxide by gaseous reduction is therefore not easy to achieve. In contrast to CO the thermodynamics for the reduction by solid carbon become more favourable with increasing temperature. Also in this instance high temperatures are essential for rapid reaction. At lower temperatures it is a solid/solid reaction which is always slow, but after the formation of primary slag it is a liquid/solid reaction and it is known that this is very rapid indeed. A drawback to this high-temperature reduction is that the carbon is only converted to CO, which means that less than 30 per cent. of the potential heat of the carbon is utilized.

Advantages and Disadvantages of the Blast-furnace Process

It is the great virtue of the blast-furnace process that it operates on the counter-current principle, both with regard to the exchange of thermal and chemical energy, and combines therefore the advantages of both methods of reduction. Reduction of iron oxide by CO to the extent of 50 per cent. is carried out in the lower temperature range and is completed by reaction with solid carbon at high temperatures. In good operation the CO/CO_2 ratio of the exit gas should be about 1.2, which represents 60 per cent. utilization of the potential heat of the coke. If allowance is made for the recirculation of heat as hot blast, this 60 per cent. is raised to nearer 80 per cent. Even if few blast furnaces are

as yet operating at this efficiency the figures indicate the capabilities of the blast-furnace process.

An important subsidiary advantage of the blast furnace is that the product is molten high-carbon iron, which separates easily and cleanly from the molten slag and is in a convenient physical form for charging into a steel furnace or for casting into solid ingots. Moreover, the high carbon, supplemented by the phosphorus and silicon also present, raises the activity coefficient of sulphur to some 4.5 times that in simple iron solution. This, together with the low oxygen potential associated with the high carbon content, means that desulphurization is much more efficient than when a low-carbon iron (steel) is being made. As sulphur is present in all the common fossil fuels, desulphurization is of critical importance.

Against these advantages must be set the following possible disadvantages, namely, metallurgical coke is an essential requirement; fine ores must be agglomerated before charging into a blast furnace; blast-furnace iron has a high content of impurities, and these must be oxidized out in the subsequent steelmaking process. The first of these is by far the most important stimulus towards the search for an alternative process. Coal suitable for the production of metallurgical coke is exceedingly scarce in large areas of the world, although the older centres of the iron industry in general have ample supplies. The other two items are rapidly losing their importance. The value of ore fines has been enhanced by developments in blast-furnace technology towards high sinter burdens. Again, there has been much talk about the value of low-carbon solid iron, synthetic scrap, in achieving a more favourable scrap/hot metal ratio in steelmaking. It seems certain, however, that the impending revolution in steelmaking will detract greatly from the cogency of this argument. Far from being a disadvantage, the metalloid impurities are essential to the pneumatic steelmaking processes. It is confidently expected that the new oxygen-blowing processes will come to dominate hot-metal practice and that normal sources of scrap will be quite adequate to meet the requirements of the open-hearth and electric steelmaking plants. Moreover, the indications are that the pneumatic processes will be the more economic, at least for ordinary grades of steel.

Three Groups

Conventional processes for the production of iron can be conveniently divided into three groups:—(1) Production of solid iron by gaseous reduction; (2) production of solid iron by reduction with solid carbon; (3) production of liquid iron.

Preliminary to a discussion of these it is useful to indicate the thermal requirements for the iron smelting process as carried out in the blast furnace. These (in per cent.) are as follow:—Reduction of iron oxides, 64; reduction of metalloids, 7; dissociation of limestone, 6; heat into pig-iron, 12; heat into slag, 7; cooling losses, 4. These figures are subject to slight variation for different types of burden and operation and certain items would be very different for non-conventional processes. Nothing, however, can really affect the fact that approximately two-thirds of the total heat requirement is for the reduction of iron oxide.

As gaseous reduction of iron oxide is slow, the major problem is, how to speed up reaction rates. In the first place that means operating at as high a temperature as possible. In the second place it means achieving highly efficient gas/solid contact. The solid must therefore be either (*a*) highly porous or (*b*) finely divided. For the porous solid in relatively large sizes, a shaft furnace is an efficient method of achieving gas/solid contact and it is in fact used in the Wiberg process. Efficient gas/solid contact when the particle size is small is more difficult. The multiple hearth roaster has long been used for this purpose and was tried for some of the earlier work on iron ore. It is, however, clumsy and slow in operation and is on the way to becoming obsolete even in the non-ferrous field. The rotary kiln can also be used for this purpose and several projected "direct iron" processes are based on this apparatus. It is not, however, a very efficient method of achieving gas/solid contact and the throughput is rather poor.

A Disappointing Feature

Far the most efficient method of achieving gas/solid contact is the fluidized bed, and not surprisingly several processes are based on it. One disappointing feature is that the onset of sintering disturbs the operation and maximum operating temperatures are restricted to between 600 and 700 deg. C., so that the advantage of the very efficient gas/solid contact is to some extent offset by the lower operating temperature. More serious is the fact that it is really a batch process and if continuous operation and a high degree of reduction are required it is necessary to have two or more beds in series.

Another restriction arising from the lower operating temperature is that CO cannot be used as the reducing gas. The reason is that the carbon deposition reaction $2\,CO = C + CO_2$ reaches its maximum over iron catalysts at about 550 deg. C. Except, therefore, for the Stelling process, which aims to produce cementite rather than iron, gases with a high CO concentration cannot be used in a fluidized bed reactor, which aims to produce a highly reduced iron.

A feature of all gas-reducing processes is that the efficiency of conversion to CO_2 and H_2O is poor. It is necessary, therefore, to remove the CO_2 and H_2O and re-cycle the reducing gas. This can be done either by reducing the CO_2 to CO over carbon at high temperature or by condensing out water. Because of the high re-cycling load, however, this is expensive in energy. For instance, in the Wiberg process the CO_2 is reduced by passing the gas over coke in an electrically-heated retort, and this is one of the heaviest energy consumers of the process.

Finally, there is the important problem of separating and compacting the product. In processes

producing solid iron, whether by gaseous or solid reducing agent, no separation of iron and gangue takes place. Magnetic separation of iron from gangue would appear to be a straightforward operation, but separation is possible only if the particles are free. In the Wiberg process, where pelletized ore is reduced, it is obvious that post-separation is, if not impossible, at least very difficult. Similarly in processes where incipient sintering has occurred, which includes all the solid reduction methods, adhesion of gangue and iron takes place and post-separation is inefficient, so much so that a material low enough in gangue for steelmaking cannot be produced in this way from a low-grade charge. The alternative is to concentrate the ore before reduction. It is important to appreciate, however, that many ores cannot be concentrated to the desired extent and mineral dressing operations designed to give a high-grade concentrate are usually rather costly. Compaction of the iron powder is usually a straightforward briquetting operation but it is an additional operation and it is necessary.

Reduction by Solid Carbon

The first problem here, as in the gas/solid processes, is how best to achieve efficient contact between ore and reducing agent. The only solutions appear to be to crush and compact, or crush and mix by mechanical means. An even more important fundamental difficulty arises with regard to the heating of the charge. A process of this type would preferably be carried out at not less than 1,000 deg. C. in order to speed up reaction rates. The heat requirements in the reaction zone are high because of the strongly endothermic reduction process

$$FeO + C = Fe + CO.$$

At 1,000 deg. C., however, the equilibrium in the reactions

$$C + H_2O = CO + H_2$$
$$C + CO_2 = 2CO$$

are so far to the right that in the presence of excess carbon a carbonaceous fuel can only be burnt to CO and H_2 with disastrous consequences to thermal efficiency. Clearly it is essential to achieve a considerable conversion of the heating fuel to CO_2 and H_2O. Equally clearly this cannot be achieved if there is intimate contact between heating gas and charge as in the blast furnace. This in turn raises another fundamental problem, that of heat transfer. If one cannot have intimate contact between heating gas and charge heat, transfer must be by radiation and conduction, and the conductivity of a bed of finely crushed solids is notoriously poor.

This latter is the most serious objection to one of the oldest processes for solid/solid reduction, the Hoganas. In this process the charge is packed into saggars, which are externally heated. Because of the low thermal conductivity, output is poor and as mechanization is difficult it is unlikely that the process will ever be extended beyond its present application, which is the production of high purity iron for special steels.

A much more satisfactory technical approach to the heating problem is that of the Krupp Renn process. The inspiration for this process seems to have been the Waelz kiln as used by the zinc industry. In the Waelz process a charge of zinc residues and carbon passes through a long, internally heated rotating kiln. At the operating temperature the charge melts, the rotary motion brings about intimate contact between melt and carbon and also increases the rate of heat transfer from combustion gases to charge. The heating fuel is burnt completely and the combustion gases are strongly oxidizing, but the carbon maintains strongly reducing conditions in the charge. Zinc oxide is reduced, the zinc vapour passes into the gas phase, where it is, of course, reoxidized and thence recovered as zinc oxide dust.

Basically the Krupp Renn process is the same. In this instance, however, particles of iron are formed which, by a process of re-oxidation at the slag surface followed by reduction below the surface, grow to pellets up to 1 cm. dia. These pellets can be efficiently recovered by magnetic separation and are sufficiently large not to require further agglomeration. The Krupp Renn process then provides a neat solution to the problems of thermal efficiency and separation and recovery of iron from low-grade ore, but there are several important drawbacks. Like all rotary kiln processes of this type, ring formation and refractory attack are serious problems. A more fundamental problem is that of sulphur pick-up. In part, because of refractory attack, it is necessary to operate with a highly silicious slag, which means that desulphurization is practically nil. Since virtually all carbonaceous fuels contain sulphur, the sulphur input to the kiln is high and a product containing 1 to 2 per cent. sulphur is obtained. Such material is quite unsuitable for steelmaking and, in fact, the only satisfactory outlet is to charge it into a blast furnace. The Krupp Renn is, therefore, more properly regarded as a concentration process for upgrading lean ores prior to blast-furnace smelting.

Sulphur pick-up, slag constitution, and refractory wear are closely related phenomena in a rotary kiln process. Either one can have an acid refractory and an acid slag, as in the Krupp Renn, or a basic refractory and a strongly basic slag. Unfortunately the latter then becomes a very refractory slag and operating temperatures of between 1,500 and 1,600 deg. C. are required to melt it. The intermediate slag of the blast-furnace type would certainly cause serious wear on either acid or basic refractories. One way of surmounting the difficulty is by operating below the temperature of slag formation. Limestone added to the charge does not go into solution and the thermodynamic activity of the calcined lime is high, which favours desulphurization. At temperatures below that of slag formation there should be little attack by solid lime on acid refractories.

The R.N. process, which currently appears to

be one of the more favoured solid reduction methods, operates on these lines. There are, of course, disadvantages in an operating temperature (of about 1,000 deg. C.) below that of slag formation. Contact between reducing agent and charge is poorer which decreases throughput. The more open nature of the charge exposes a greater surface to oxidation by the combustion gases and it is necessary to maintain a large excess of solid carbon. The excess is recovered and recycled, but at additional cost. Lastly, separation of the products is poor. A high-grade product can be produced from a high-grade concentrate, but the product from lower grade ore has too high a gangue content and is only suitable for blast-furnace feed.

One obvious method of supplying the thermal requirements of a solid reduction process is electrical and several attempts have been made along these lines. Quite apart from the question of whether such a high-grade form of energy can be economic, there are obvious practical difficulties in generating heat from electricity in a rotating kiln.

Production of Liquid Iron

It is not intended to discuss electro-smelting under this heading. The principles are well understood and the application turns almost entirely on the cost of electricity. It must be very low before the process can compete with the blast furnace.

Operation of a rotary kiln could obviously be modified to produce liquid iron and experiments along these lines have been made. A major difficulty has already been discussed, that of slag composition and refractory attack. A further point is that the reducing carbon will tend to float on the slag surface out of contact with the iron so that a low-carbon iron will be produced. This has obvious attractions, but account must be taken of the fact that the melting point, and therefore the temperature of operation, will be raised. Also, desulphurization of low-carbon iron is more difficult. These objections can be met by raising the lime content so that the slag is semi-solid, but, of course, only at the expense of a serious increase in the thermal load and fuel requirements. A process of this type (Basset) has operated for some years in Denmark and the extra operating cost covered by using the slag as cement clinker. Apart from any other consideration, coupling iron production to cement production imposes serious restrictions.

A further line of approach that has received much attention in recent years is the so-called low-shaft furnace. This is, in fact, simply an attempt to operate a blast furnace with carbon other than metallurgical coke. The method is to incorporate the carbon (coal or coke) with the ore and briquette the product. The intimate mixture of coal and ore means that practically all reduction is by the reaction $FeO+C=Fe+CO$ and the exit gas has a high CO/CO_2 ratio. The thermal efficiency of such a process is poor and a use must be found for the large volumes of exit gas of low calorific value.

In many ways the most attractive approach is that of flame smelting. The idea is to smelt finely powdered ore in a gas phase suspension, that is, more or less as an extension of the powdered-fuel burner.

There is, however, an important difference between complete combustion of coal and combustion to give the highly reducing gases necessary for the reduction of iron oxide. In the first instance oxidation of carbon particles can take place not only directly with oxygen but by the two reactions

$$C+CO_2=2CO \text{ (gas/solid).}$$
$$2CO+O_2=2CO_2 \text{ (homogeneous gas).}$$

The concentration of oxidizing gas remains substantially constant and so should the reaction rate. In the second instance we are concerned only with the first of these reactions. As the reaction proceeds the concentration of the reactants decreases and hence the rate of reaction. It is not unexpected, therefore, that a high CO/CO_2 ratio is difficult to achieve and carry over of unreacted carbon tends to be high.

It is much easier to burn hydrocarbon fuels to give a reducing gas, but, as pointed out earlier, when fuels are burnt only to $CO+H_2$ the hydrogen content of the fuel can make no contribution to the heat developed. If might appear from Table 1 that a considerable conversion to CO_2 and still more H_2O is possible. The values shown refer, however, to pure FeO. If the FeO is in slag solution, as it must be in flame smelting, these figures must be amended. For instance, if the aim is not more than 2 per cent. FeO in the slag then the corresponding equilibrium gas ratios must be multiplied by a factor of about 50, allowing for deviations from ideality of the slag solution. Under these conditions the reducing gases are practically all $CO+H_2$. The effect of this on the available heat at 1,500 deg. C. is illustrated in Table 2 for coal and heavy fuel oil burnt in oxygen to give $CO+H_2$.

TABLE 2.—*Availability of Heat in Coal and Fuel Oil Compared.*

—	Available heat at 1,500 deg. C., B.Th.U./lb.	Per cent. of total calorific value
Coal	1,100	8
Fuel oil ..	850	4.5

These figures show how much inferior hydrocarbon fuels are under these conditions. Still more significant is the fact that, even for coal burnt in oxygen, the available heat at 1,500 deg. C. is only 8 per cent. of the potential heat. A single-stage flame smelting process offers no prospects of success, the only line of attack seems to be to use the chemical and thermal energy of the gases from the smelting unit to prepare the charge for smelting. In other words, to achieve in two or more stages that counter-current exchange of thermal and chemical energy that the blast furnace achieves in one.

Conclusions

The modern blast furnace is a highly efficient smelting unit. Where adequate supplies of coking

coal are available it has, as yet, no rival. What were formerly regarded as two important drawbacks, the high impurity content of the metal and the necessity to agglomerate fine ore prior to charging, promise to be assets rather than liabilities. Conversely the fact that low-carbon iron may be produced from ore fines by non-conventional methods is a less certain advantage of those methods than had been thought. The one sure asset of such methods is the ability to dispense with coking coal.

The major problems that arise in the development of non-conventional methods are:—

(1) Efficient use of the thermal and chemical energy of the fuel. None of the newer methods utilize fully the principle of counter-current flow on which blast-furnace efficiency rests. The problem has been solved in some instances, notably the rotary kiln methods, but in others it is a major preoccupation.

(2) The separation of gangue and iron is a most important problem in all processes carried out below the fusion point of both gangue and metal. Separation of the products is very inefficient. A product low enough in gangue can only be obtained from high-grade concentrates; otherwise the gangue content, even after magnetic separation is too high for use in steelmaking and must be charged into a blast furnace. The production of high-grade concentrates is only possible with certain ores.

(3) Sulphur pick-up is a serious problem in those processes in which slag formation occurs. It is not always realized that in the blast furnace the low oxygen potential of the slag and the high metalloid content of the metal are at least as important as slag basicity in controlling the sulphur. Failure to reproduce these conditions is bound to lead to serious desulphurization troubles.

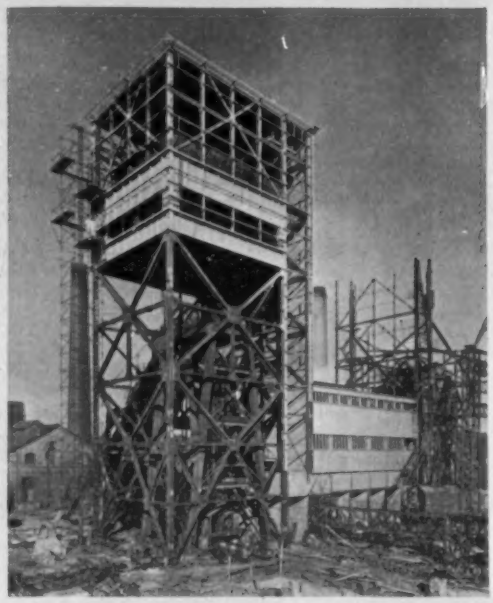
(4) In most processes carried out at temperatures below the fusion point of slag and/or metal complete reduction is difficult. Oxygen contents of the order of 5 per cent. are common and this should be taken into account when assessing the value of the product as steel melting stock.

One further point may be made. In general, it would appear a very dubious policy to use these new processes to produce what is in effect low-grade scrap for charging into the blast furnace. Krupp Renn furnaces are doing just this in a number of places and it has been suggested that the R.N. process could be employed in the same way.

It may be the most economic way of utilizing certain rather difficult lean ores. One suspects, however, that the rapid advances in blast-furnace efficiency over the last few years are not always taken into account. The coke required to melt scrap should be much the same whether the furnace is operating at low or high efficiency and should be 4 to 6 cwt. A few years ago 16 cwt. per ton iron was recognized as fairly good practice for rich ores, whereas now 12 cwt. is being achieved. The saving in coke from charging scrap is very different in the two instances.

Brodsworth Main Reconstruction

TWO winding installations were completely replaced in the recent reconstruction scheme at Brodsworth Main Colliery (Yorks), the work being undertaken by Head Wrightson Stockton Forge, Limited, a subsidiary of Head Wrightson & Company, Limited. The only item of existing equipment to remain at Nos. 1 and 2 shafts was the headframe at No. 1 shaft, which, after modification, is to be used as a guide tower. Head Wrightson's contract covers the design, fabrication, and erection of the steelwork, the design and execution



WINDING INSTALLATIONS UNDER CONSTRUCTION AT BRODSWORTH MAIN COLLIERY.

of the civil engineering work, the cladding of certain buildings, and also the supply of overhead travelling cranes.

The No. 1 shaft winder tower covers an area of some 2,500 sq. ft. and is 157 ft. high to the eaves from the shaft collar level. As far as the deflector floor level, the tower is of braced construction with horizontal girders provided at intervals up the tower to take care of torsion. The deflector floor supports the pulley sheaves and much of the control equipment, and for manual operation the control mechanism is also located on this floor.

On No. 2 shaft a completely new guide tower was supplied consisting of four main columns braced to form the tower and fitted with hydro-pneumatic buffers, Bennett catches and guides, in the same way as the No. 1 shaft.

British Iron and Steel Industry Translation Service

FOLLOWING is a list of some new translations available from the Iron and Steel Institute under its translation service scheme. Translations are all classified by numbers, and these should be quoted on application, which should be addressed to the institute at 4, Grosvenor Gardens, London, S.W.1. Further lists will appear from time to time.

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IRONFOUNDING HEALTH AND SAFETY CONFERENCE

EXTENSIVE progress has been made in many matters concerning the health and safety of workpeople in the ironfounding industry and, indeed, the foundry industry as a whole since the Council of Ironfoundry Associations held its last safety conference six years ago. The work of the CFA's Safety Committee has produced much additional knowledge on many problems of health and accident prevention affecting foundry managements and operatives, and much of it will be considered at a conference to be held at the Norbreck Hydro, Blackpool, from April 6 to 8.

A foundry safety equipment exhibition will remain open throughout the conference.

A NEW German periodical, Aufbereitungs-Technik, introduced by Verlag für Aufbereitung GmbH, Wiesbaden, is designed to deal with all problems concerning the processing of solid raw materials in various branches of industry.

Steel Desulphurization With Magnesium

RAPID desulphurization of steel in the furnace, coupled with excellent hot ductility of the treated metal, has been obtained with additions of magnesium, according to W. B. Brooks, A. C. Doumas, and B. W. Romefelt, all connected with the Dow Chemical Company, USA. The authors refer to it in an article published in Iron Age (February 11, 1960).

A degree of success in the past, they recall, has been obtained with calcium, cerium, certain slag practices, and lengthy furnace treatment. Although, based on thermodynamics alone, calcium should be very effective as a desulphurizer, its extremely low solubility in liquid steel limits its effectiveness. Magnesium, on the other hand, has faster solubility and acts more directly on sulphur.

Results of Experiments

Research has shown that magnesium powder diluted with lime can be successfully injected into molten steel. While most of the work at the Dow Chemical Company has been restricted to 500-lb. basic electric furnaces, trial heats have also been run in 5-ton and 20-ton furnaces, the magnesium additions more easily being carried out with larger heats. From 2.5 to 5 lb. of magnesium per ton of steel was found to give rapid sulphur reduction, no elaborate slag practice being necessary. So far, over 100 500-lb. heats have been treated, results indicating that between 50 and 80 per cent. of the sulphur in the bath can be removed. In general, starting with a fairly low sulphur content of from 0.020 to 0.030 per cent., consistent reductions to levels below 0.003 per cent. S can be obtained.

Magnesium-treated steels of suitable composition have an exceptionally high ductility at elevated temperatures. Thus an SAE No. 1020 steel containing, C 0.18-0.23; Mn, 0.30-0.60; maximum P 0.040 and S 0.050 under tensile test at about 1,250 deg. C., fractured with practically no reduction of area, while after treatment with magnesium a similar specimen gave almost 100 per cent. reduction in area without fracture. As-cast Charpy impact data revealed that treated steels had double the impact values of untreated.

The authors, recognizing the possible effects of the small heats so far treated, state that further experiment is necessary with larger furnaces and ladles. Investigation of transverse properties, and treatment of other alloy steels are aspects of the subject calling for further study.

Trade with "The New West"

Attention of British manufacturers to the opportunities which exist in the 11 western States of the United States is drawn in "The New West," a booklet prepared by the Dollar Exports Council, 21, Tothill Street, London, S.W.1. "It is still 'The Golden West' for enterprising businessmen," the publication emphasizes.

Deep-mined Coal Output Stable

ANY variation in total output of saleable coal is provided largely by open-cast production, which in the first 11 weeks of the year has dropped by 1,000,000 tons on the comparable period of 1959. Deep-mined output remains fairly steady at just under 4,000,000 tons, or about 4 per cent. below last year's rate of production. Output per manshift at the face is now 0.1 cwt. below the 80 cwt.-mark and overall it has reached 28.38 cwt.

From most divisions comes news of satisfying tonnages of stocks lifted. Overall a drop in undistributed stocks of 100,000 tons is not as great as might have been expected, but too little is going to industry and the domestic sector. A drop of 200,000 tons in distributed stocks for the week ended March 12 was spread overall the principal consumers and stocks were nearly 2,000,000 tons less than a year ago.

There were 620,000 wage-earners on colliery books on March 12, against 673,200 on March 14, 1959, the numbers engaged at the coal face being 237,600 and 262,000, respectively. Total absenteeism (all workers) in the week ended March 12, was 15.23 per cent., compared with 16.37 per cent. in the week ended March 14, 1959. Output at the face was 3.995 tons and overall 1.419 in the week ended March 12, compared with 3.788 and 1.380 in the week ended March 14, 1959.

The following table gives (in tons) the output of saleable mined coal by division in the week ended March 19, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended March 19, 1960.		Week ended March 21, 1959.
	Total output.	Tonnage lost.	Total output.
Scottish	368,000	7,900	386,400
Northern (N & C) ..	244,100	—	266,700
Durham	473,600	700	490,000
North-Eastern ..	845,800	12,100	906,500
North-Western ..	279,900	—	296,900
East Midlands ..	925,800	700	930,100
West Midlands ..	304,400	900	329,900
South-Western ..	413,700	7,400	433,000
South-Eastern ..	31,700	—	34,100
Great Britain—			
Deep-mined coal ..	3,887,000	29,700	4,073,600
Other deep-mined (including licensed mines) ..	50,200	—	56,700
Open-cast coal ..	169,600	—	247,800
TOTAL ..	4,106,800	29,700	4,378,100

Pirnhall Colliery Wins Safety League

WINNER of the 1959 safety league in the Alloa Area of the Scottish Divisional Coal Board was Pirnhall Colliery, with a frequency rate of 29 accidents per 100,000 man shifts. Speaking at a recent complimentary dinner at Sauchie, Mr. D. J. Skidmore, divisional production director, said that during 1959 there had been only 14 accidents in the mine necessitating a man being off work for more than three days.

Mr. Skidmore spoke of the general need for a live safety committee, not afraid to work and to improve standards. Accidents, he said, affected production and, more important, brought about a general lowering of morale within the industry.

Fatality "A Reminder of Mining Hazards"

FATAL accident in which a man was trapped by a roof fall at Parkhouse Colliery (Staffs) was "a reminder to us of the hazards under which these men work even when every care has been taken," said the coroner, Mr. F. G. Hails, at a Stoke-on-Trent inquest last week. The jury returned a verdict of Accidental Death on Mr. Frank William Riley (26), who died in hospital from his injuries.

It was stated that after the third of three shots had been fired during mining, a prop was found to have been dislodged. Three men began shovelling coal away to replace the prop, but there was a roof fall and Mr. Riley was trapped. A deputy, Mr. William Edwards, said: "I examined the roof of the surrounding area and tested it and I thought it sounded safe and I could see no visible breaks whatsoever."

The coroner told the jury: "It appears that everything was in order and that it was an accident."

Fife Coalfield Has "Healthy Future"

FUTURE of the coal industry in Fife looked decidedly healthy, said Mr. George McAndrew, manager of Leven Employment Exchange, in a statement last week. The National Coal Board had given an assurance, he said, that the coalfield would carry on for a long time.

"In addition the board has in Wellesley and Michael collieries two of the biggest pits in Scotland, employing some 5,000 men," said Mr. McAndrew. "Once the present reorganization finishes, the pits will continue to employ much the same volume of labour."

The youth employment officer for Wemyss, Mr. J. Sneddon, revealed that the board intended to take on about 300 boys in the West Fife Area this year—twice the number taken on last year. He continued: "I hope there will also be jobs in the industry for more than 200 boys this year in the East Fife Area."

Mr. G. H. Thomas Appointed Mines Inspector

MANAGER of Duffryn Rhondda Colliery (Glam), Mr. G. Hugh Thomas has been appointed HM Inspector of Mines and Quarries. Mr. Thomas, who is 33, graduated in mining and mines surveying at Cardiff College of the University of Wales when he was only 19.

After practical mining experience, Mr. Thomas obtained the first-class colliery certificate in 1948, and from 1949 until 1952 he worked as an overman in several pits in the East Midlands Division of the National Coal Board.

He was then appointed undermanager at Pleasley Colliery in the No. 4 (Sutton-in-Ashfield) Area of that division. Mr. Thomas became manager of Duffryn Rhondda Colliery in 1954.

OFFER BY Charles Karen (Holdings), Limited, to acquire Wilmer Lea Foundries (Holdings), Limited, has been accepted by holders of 71 per cent. of the share capital and is now unconditional.

Law Cases

NCB RIVER POLLUTION

Riparian Owners Refused Interdict

APPLICATION by riparian owners on the River Tyne, between Ormiston and East Linton, East Lothian, for interim interdict to stop pollution of the river by the National Coal Board was refused by Lord Walker in the Court of Session. The board did not deny pollution but maintained that the result of an interdict—the closure of two collieries with consequent unemployment—outweighed anticipated further damage to the riparian owners' fishing rights.

The application was by Hopetoun Estate Development Company, Limited, and others, seeking an order to stop the board discharging noxious matter from Tynemouth pumping stations. For the owners, Mr. C. H. Johnston, QC, said that as a result of the pollution, at least three miles of the Tyne were almost completely sterile. This was illegal pollution which ruined the valuable salmon, sea-trout, and trout fishings. The longer the pollution continued the more difficult it would be to restore the river to its pre-pollution state.

For the board, Mr. J. O. M. Hunter, QC, said there was a substantial body of authority on the question whether it was illegal to allow underground water to drain from collieries no longer being worked. Steps had been taken to remedy the trouble, he said. If the board were stopped from polluting the river, two mines would have to close, causing redundancy of 336 miners and a loss of coal output of 410 tons a day.

WAGON DAMAGE NOT MALICIOUS

MAN who used a wooden prop to release the brakes of coal wagons, causing them to crash into an engine, was found Not Guilty at a special sitting of Pontardawe (Glam) Court of malicious damage to the engine and wagons. The defendant, Mr. Ronald Williams (26), was awarded 30s. costs against the National Coal Board for the loss of a day's work when the board was unable to prosecute at a previous hearing.

Mr. Williams was alleged to have driven into Cwmgors Colliery yard and along a line of wagons to load coal on to his lorry. He had been told to leave the wagons alone because the engine was derailed.

Defending, Mr. John James said that Mr. Williams often released wagon brakes to get at the coal. On this occasion he waited an hour for the wagons to be shunted and when he released the brakes he was unaware the engine was off the rails. When he did realize it, he ran to the engine and shouted a warning to the driver.

£3,629 FOR LOSS OF EYE

MAN who lost the sight of an eye in a works accident was at Birmingham Assizes awarded damages of £3,629, including special damages of £1,129, and costs against his employers, the Round Oak Steel Works, Limited, of Brierley Hill (Staffs). It was stated that the plaintiff, Mr. Arthur Simpson (41), was clearing slag from a furnace when a piece of slag flew upwards and struck him in the right eye. The defendants denied negligence and alleged contributory negligence on the part of Mr. Simpson.

Mr. Justice Marshall said that in his opinion the work being carried out came within the scope of regulations obliging employers to provide eye protection for their workers. A defence argument that because the plaintiff was not the man using the drill he was not engaged in breaking the slag was defining the meaning of the regulations too closely. The judge was satisfied that the firm had at no time supplied goggles for the work.

REFUSED SEARCH CHARGE

COLLIERY stripper was alleged at Kirkcaldy (Fife) Sheriff Court to have "made off" underground at Michael Colliery, East Wemyss, when told he was to be searched. The accused, Andrzej Nikiperowicz, denied that he refused to allow himself to be searched by a deputy. The case was adjourned until today (Friday).

The deputy, Mr. Thomas Birrell said he told Nikiperowicz that he would have to leave the colliery if he would not be searched. Nikiperowicz made off down the run and said, alleged Mr. Birrell: "Give me a chance and I won't do it again."

In evidence, Nikiperowicz agreed that his first reply to Mr. Birrell indicated he was not carrying contraband. He denied pleading with Mr. Birrell not to report the matter for the sake of his wife and children, and agreed with the fiscal that he was standing prepared to allow himself to be searched when the searcher walked away for some unknown reason.

UNLOADING SYSTEM "UNSAFE"

YARD labourer whose pelvis was broken while he was unloading rubbish tubs at Frickley Colliery (Yorks), was at Leeds Assizes awarded £1,150 damages with costs against the National Coal Board. Giving judgment for the plaintiff, Mr. John George Theodore Bower (49), Mr. Justice Salmon described the unloading system as grossly unsafe and said it was a miracle there had been no accidents before.

"It seems to me," he said, "to be obvious that if you lower a crane in this way and it is attached to the chain merely by a hook, a perfectly ordinary hook, and if by mischance the tub comes in contact with the ground, there is real risk that the chain will then become slack and if it does, the hook is likely to became detached and someone will be badly hurt if

not killed." The judge could find no grounds on which Mr. Bower could be blamed for the accident.

TRAPPED BY CASTING

WORKMAN who suffered knee injuries when he was trapped by a heavy metal casting swinging from a gantry, was awarded damages of £1,446 and costs at Birmingham Assizes against Alldays & Onions, Limited, founders and general engineers, of Birmingham. The defendants denied negligence and alleged contributory negligence by the plaintiff.

Giving judgment, Mr. Commissioner Mocatta, QC, said the plaintiff, Mr. Frank Stansfield (47), would be left with a permanent slight disability. The only real allegation of contributory negligence against him was that he did not get out of the way quickly enough. Mr. Stansfield could hardly be blamed for that, said the Commissioner.

SPLASHED BY MOLTEN METAL

DAMAGES of £400 were awarded at Derby County Court to Mr. Bernard Smith (47), moulder, who suffered a permanent eye injury when splashed with molten metal. In a reserved judgment, Judge Sir Henry Braund said that the defendant company, Park Foundry (Belper), Limited, had provided goggles for workmen in 1954. The men refused to wear that particular issue because of condensation.

"It was a difficult situation for the management," said the judge, "but so far as the evidence goes, nothing has been done about it and work has gone on with the men wearing no eye-protection at all."

GRINDER LOST TWO FINGERS

MAN who received severe hand injuries while operating an electrically-driven grinding machine received £2,000 in settlement from his employers, the Steel Company of Wales, Limited, at Glamorgan Assizes. The plaintiff, Mr. Harry Trolley, claimed damages for injuries received in the accident at the Abbey Works, Margam.

Mr. Justice Barry gave judgment by consent to the plaintiff.

ENGINEER TRAPPED IN LIFT

LIFT engineer who was trapped for an hour in a goods lift had had a most shattering experience, said Mr. Justice Salmon at Leeds Assizes. The man, Mr. Arthur Preston Miller (26), it was stated, would have a shocking disability for the rest of his life. He was awarded £2,625 damages and costs against Keighley Lifts, Limited, by whom he was employed at the time of the accident. The judge found Mr. Miller 25 per cent. to blame.

SCRAP DEALER Victor Leslie Lacey (63), who bought stolen copper worth £1 from a 14-year-old boy, was fined £100 by Swansea Magistrates with the alternative of three months' imprisonment. Lacey admitted receiving the copper knowing it to have been stolen and receiving copper under a certain weight.

LABOURER WHO was struck by the jib of a crane was awarded £2,718 damages and costs against his employers, Richard Thomas & Baldwins, Limited, in the High Court. The plaintiff, Mr. Thomas Freeman (58), received back and leg injuries in the accident which occurred at the company's Blackwall, London, factory, while he was unloading steel from a truck. The company denied liability.

FOUR-MONTH-OLD boy was burned by a piece of coal which flew out of the fire and into his pram, it was stated at Stratford-on-Avon County Court. The father, Mr. W. M. P. H. Child, who claimed £400 damages for his son from the National Coal Board, said the accident occurred when a detonator, left in the coal, exploded. The child had received plastic surgery for facial burns. Judge M. Hamilton, who adjourned the case, said he would not award damages until he had received an up-to-date medical report.

PRISON SENTENCES were imposed at Staffordshire Assizes on four men found Guilty of offences arising from the theft of a lorry-load of aluminium ingots worth £1,800. William Alexander Tilbury (45), haulage contractor, was imprisoned for three years after admitting stealing the ingots in transit between London and Birmingham; Thomas James O'Boyle (48), scrap dealer, received two years for stealing the ingots and receiving them, knowing them to have been stolen; Levi Walters (64), scrap dealer, was sentenced to 18 months for receiving; and Reginald Charles Jones (34), haulage contractor, was given a 30-month sentence, to run consecutively with an existing sentence of 18 months, after being found guilty of theft.

Bedevilment of the Mining Industry

"IT is a fallacy to think of joint consultation as joint management. Management has to take the responsibility, but if a decision has to be taken which affects the workmen, joint consultation is the means of putting them in the picture and securing their goodwill and co-operation. More than ever before the industry requires real active co-operation," said Mr. L. R. Milligan, industrial relations director of the Scottish Divisional Coal Board, on Thursday of last week. He was addressing the Mining Institute of Scotland.

Advocating joint consultation as the best way of overcoming the daily stoppages, indiscipline, and absenteeism which bedevilled the mining industry, Mr. Milligan said strikes were anti-social and if relations between management, trade union, and workman were right then any difference which arose ought to be capable of solution without loss of output.

Appealing for an end to absenteeism, the speaker said that wages were at such a high level that men who chose to work only a limited number of shifts in the week need not work all the shifts available to them. This state of affairs had been described as buying leisure, but management would prefer a much more reliable labour force.

OVERWHELMING RESPONSE TO ROBERTS, SPARROW OFFER

SO overwhelming was the public response to the Birmingham Industrial Trust's offer of 750,000 2s. shares in Roberts, Sparrow & Company, Limited, iron and steel stockholders and shearers of Wolverhampton, at 6s. each, that all allotments have had to be made by ballot.

Applications numbered 22,437 and the shares have been allocated on the following basis:—200 to 500 (in proportion of one in 12), 200; 600 to 1,900 (one in 10), 300; 2,000 to 3,000 (one in eight), 400; 3,100 to 5,000 (one in seven), 500; 5,100 to 10,000 (one in six), 600; 10,100 to 49,900 (one in six), 700; 50,000 and over (one in five), 700. The proportion of successful applicants in the first two groups was 72 per cent.

IRON AND STEEL TRADE

MARGIN between current steel production and maximum capacity is narrowing and there appears little scope for further expansion. However, there is some evidence that deliveries are running ahead of actual consumption and that consumers are increasing stocks as a safeguard against possible shortages. Except in the case of steel sheets, such shortages have not yet developed and completion of new plant later this year should increase considerably the supplies of home-produced sheet. Forward planning seems to have enabled the industry to keep abreast of the rise in industrial requirements.

Pig-iron

Proportionally the rise in pig-iron production since the boom began has been greater than that of crude steel, and the limits of blast-furnace outputs have not been reached. The industry's development plans have been based upon the expectation that a bigger percentage of pig-iron would be used in the steel furnace mixtures and this variation is already taking place.

Not that the use of scrap is falling into disfavour. Scrap is much the cheaper material, but, as was foreseen, there is not enough of it and consequently more pig-iron has become a prime necessity.

Favourable results have attended the improvement in blast-furnace techniques, the increasing use of sinter, the preparation of ores, and the growing use of oxygen, but the employment of more blast furnaces cannot be much longer delayed and this development is brought into the immediate foreground by the rising imports of foreign ores.

Ferro-alloys

The price of ferro-tungsten is unchanged and there is a fairly steady demand. Ferro-molybdenum is in reasonable request, as is ferro-vanadium. The position regarding ferro-silicon shows little change, strong support being maintained. Moderate support is forthcoming for ferro-chrome, and calcium silicide is fairly active. The demand for silico-manganese and ferro-manganese is at a good level.

Ferro-titanium is quite active, and steady attention is given to ferro-niobium.

Semi-finished Steel

One of the many decisive changes in the steel industry has been its emancipation from dependence on substantial imports of semi-finished steel from western Europe.

An analysis of UK imports of iron and steel indicates that requirements have been running slightly in excess of home production, but capacity is increasing and only small marginal tonnages of foreign semis are required.

Finished Steel

Demand for finished steel products is more evenly spaced, with heavy joists, sections and plates coming more prominently into the picture. The rise in direct exports appears to have been halted, but builders of industrial plant have booked exceptionally large contracts both for home industries and also for oversea, and contractors generally are taking care to cover their requirements well in advance.

Rollers of steel plates are kept busy despite the restraints imposed by the dwindling order-books of the shipbuilders, and there is a large miscellaneous demand for small bars, light sections, reinforcing rods, and wire products.

Eire Government to Finance Irish Steel Expansion

EIRE Government has asked the Irish Parliament to approve an expenditure of £300,000 for the purchase of shares in Irish Steel Holdings, Limited, the Irish State-sponsored steelworks at Haulbowline (Co. Cork), by the Ministry of Finance.

Referring to this in Leinster House on Tuesday, Mr. J. Lynch, the Irish Minister for Industry and Commerce, said that since Irish Steel Holdings had acquired the assets of Irish Steel, Limited, in June, 1947, the industry had been financed by fluctuating bank accommodation guaranteed in part by the Minister for Finance and by the trading profits of the company. The soundness of the industry, he said, had been confirmed, by its successful progress over the past 10 years.

In March, 1958, the Government approved in principle of certain proposals for major expansion. These expansions envisaged a greater range of outputs and consequently an increase in capital expenditure. Employment was expected to expand from the present figure of 500 to rather more than 700. The estimated cost of this development was £3,500,000. The Government had decided that the project should be wholly financed by share capital subscribed by the Minister of Finance, and legislation to give effect to this was in preparation.

All Hadfields Employees Receive Annual Report

PRINTED copies of its balance sheet and annual report are to be sent by the Hadfields, Limited, group of companies to each of its thousands of employees. A letter from Mr. Harold Humphries, deputy chairman and managing director, accompanies this year's report, pointing out that each member of the group has his part to play and obligations to fulfil in trying to achieve reasonable prosperity.

"We are all aware that the success of the group inevitably reacts on our own livelihood and I believe your personal contribution will continue to be as in the past loyally and honestly observed," Mr. Humphries writes.

The report refers to a falling off in some specialized products in the early part of the year and an improvement in the later stages.

THE Shipbuilding Employers' Federation on Wednesday met the Association of Engineering and Shipbuilding Draughtsmen to discuss a claim for a shorter working week. No agreement was reached and a new meeting was fixed for April 11.

Coalfield News

Allerdean Drift Mine Reopened

WORK has begun on the drift mine which the Elsdon Colliery Company, Limited, is opening with the NCB licence handed over to them by the unemployed miners at Blackhill who were unable to form their own organization to work the mine. A road is being laid and plant assembled to start pumping water from the drift, which has been flooded for more than 30 years. When in production again the Allerdean mine is expected to employ about 30 men.

The first man to be taken on is Mr. William Foreman, a winding engineer, who was also the first miner to start at Blackhill 20 years ago.

WHITBURN MINERS BRASS BAND was placed third in the Scottish Amateur Bands Association's second section championship at Airdrie, on Saturday.

BARRIE MEESON, 19-year-old apprentice welder at Wolstanton Colliery (Staffs), completed the John o' Groat's to Land's End walk on Tuesday.

MINERS TOOK FIRST three places in a 25½-mile walk between Barnsley and the Sun Inn, Doncaster, organized by the Doncaster Road Working Men's Club, Barnsley, on Sunday.

AFTER 46 YEARS in mining, Mr. F. Haller, holder of two Carnegie awards for bravery in the mines—the Edward Medal and the Rescue Medal—and the BEM has retired.

PRESENTATIONS were made last week by Mr. Vivian Savage, the colliery manager, to 15 miners who have given a total of 777 years' service at the Deep Navigation pit, Treharris.

AT A DINNER in Newcastle-upon-Tyne last Friday, the North of England branch of the National Association of Colliery Managers collected £55 in aid of the World Refugee Fund.

LARGE POCKET of methane gas was discovered at Cefn Coed Colliery (Glam), the deepest anthracite pit in the world, on Monday and 500 miners were sent home until it could be drained off.

BECAUSE the seam that they were working is to be closed, a number of miners from Whitburn Colliery (Co. Durham) are to be transferred to the nearby Westoe, Hylton, and Wearmouth pits.

LINGERWOOD AND PRESTONLINKS collieries in the Lothians Area of the Scottish Divisional Coal Board were joint winners of the 1959 Safety League for collieries of over 500 tons production a day. Bellyford Colliery won the under-500-tons-a-day section.

FAULDHEAD AND GLENTAGGART collieries have received diplomas for the lowest accident rates for Ayrshire collieries in 1959 for pits producing over 500 tons and under 500 tons a day, respectively. Diplomas for the greatest improvement in accident rates in 1959 went to Douglas and Whitehill collieries.

DIPLOMA TO Minto Colliery (Fife) for winning the Scottish Divisional Coal Board's West Fife Area Accident League competition in 1959 was presented at a complimentary dinner at the Area headquarters, Cowdenbeath, last week. Torry Colliery gained a diploma for the best improvement in the past three years.

SECRETARY of the Cumberland branch of the NUM since 1937, Mr. Tom Stephenson has retired. His successor will be named on Friday, after a ballot by Cumberland's 4,500 mineworkers. The two candidates are Mr. Maurice Rowe, at present Mr. Stephenson's assistant, and Mr. Thomas Ritson, a face worker.

"TOP PIT" entertainment competition is being organized for mineworkers and their families in the Rotherham Area of the North Eastern Divisional Coal Board. Teams will be drawn from Cadeby, Manvers Main, Cortonwood, Silverwood, New Stubbin, Kilnhurst, Barnburgh, Denaby, and Wath Main pits, and from Manvers coal preparation plant.

STOCKS OF UNSOLD COAL in the Northern (N&C) Division were reduced by over 350,000 tons during the first few weeks of the year. Mr. Leslie Graham, chairman of the division, stated that this was due to increased demand caused by the cold weather and it must not be assumed that the situation would continue. There are now about 1,300,000 tons of coal stocked in the division.

NEW PITHEAD BATHS were opened at Longhirst Colliery (Northumberland) on Saturday by Mr. J. Macfarlane, county president of the Northumberland Mechanics' Association. He said that the completion of the scheme meant that pithead baths were now provided for almost all the miners of the county. The baths cost £67,000, and provide lockers and other facilities for 600 men.

COAL AND COKE shipments from South Wales ports last week totalled 59,573 tons, 12,629 tons more than in the previous week and an improvement of 5,685 tons on the corresponding period of last year. Shipments from the various ports (with comparable 1959 figures in parentheses) are as follow:—Newport, 9,974 (11,231) tons; Cardiff 8,868 (6,106) tons; Penarth, 3,375 (4,776) tons; Barry, 15,306 (11,326) tons); Port Talbot, 1,357 (4,034) tons; Swansea 20,693 (16,415) tons.

OVER 700 YEARS' service in the mining industry was represented by 14 retired miners, guests of honour at a function in Stirling given by the Manor Powis branch of the NUM. Long service certificates were presented by Mr. Peter MacArthur, public relations officer for the Alloa Area of the Scottish Divisional Coal Board, and gifts from the union were presented by Mr. J. Tennyson, a member of the Scottish executive.

TROUBLE IS BREWING between the miners of Worsborough, near Barnsley, and the local urban council, over the ancient game of nipsy, in which players strike a hard wooden peg in mid-air with a long pole. The council has refused to allow inter-village nipsy matches on the local recreation ground, because the game is considered dangerous. The miners have written a letter of protest to the council and are considering the question of a petition in time for the opening of the nipsy season in under a fortnight.

Yorkshire Council Victory for Coal

IN spite of charges of "absurd and wasteful expenditure," "an inferior job," "political nonsense," and "criminal stupidity," Labour members of West Riding County Council won a battle for coal on Thursday of last week. The Conservatives and others tried to have referred back a decision to change from oil to coal the heating system at a new £250,000 building in Wakefield. The Conservatives maintained that the change would result in more than £1,000 extra cost and £256 a year more in maintenance.

Councillor W. Henry (Labour), a miners' representative, said the council had to choose between putting money into foreign enterprises or supporting the British miner in having a decent standard of living. Other Labour speakers denied that costs would be increased and emphasized that the Yorkshire coal industry must be safeguarded.

THE COAL TRADE

PRESSURE appears to have eased all round and the orders coming forward in the domestic sector are much more steady and within merchants' capacities to handle—provided there are not too many delays in transport. These too are now less worrying, but however minor, they can still cause irritation and a hindrance to the building-up of good public relations. In the industrial sector there is a growing volume of orders to match the rising tide of output, particularly from the steelmakers.

SCOTLAND

Glasgow—A difficult period for supplies seemed probable when a late spell of cold weather found house coal short of requirements, but the crisis is over. Supplies of round coal fell short of trade requirements, but the gap is now filled with doubles and trebles, which are fairly popular. Merchants are drawing heavily from stock—now down to 79,000 tons in the division, compared with 96,000 tons last year—and this should help to maintain trade. The Coal Board is clearing some round coal laid last summer when no outlet was found for it. This helps to reduce the unsold surplus of 1,100,000 tons, compared with 1,500,000 tons at the beginning of the year, although the biggest factor in this movement is the uplifting of coking coal to help meet a rise in demand created by the activity in the ironmaking industry.

Consumption of coking coal is now about 28,000 tons a week against 18,000 tons last year. Supplies are being increasingly diverted from other users, who are now having to accept mostly ordinary pearls and smalls. Singles are tight, especially in west and central districts.

Doubles for gas-making and other industrial purposes have been clearing well. Duff, exceptionally, keeps quiet, the balance remaining after the production of washed smalls being slow to clear. Anthracite duff, however, is enjoying a brisk demand, especially for shipment to the near Continent. Anthracite nuts are also busy, but large is easier. Gas coke and hard coke nuts are comfortable, and despite the increase in demand, metallurgical coke is meeting requirements.

Fife and Lothians—Despite an improvement in the weather, supplies of all kinds are moving away well. The disadvantages of heavy rail freights are preventing more business from being done in singles, particularly with the industrial west. Exports continue to improve on last year.

Colliery Works Death: Jury Alleges Negligence

NEGLIGENCE was alleged by a coroner's jury at a Forest of Dean inquest last week on Mr. William Ernest Frederick Morse (57), who was killed at Cannop Colliery on March 2. It was stated that Mr. Morse was riding on a journey of trams when he became trapped between them. His spine was fractured when his head hit a roof support.

The jury returned a verdict of Accidental Death and alleged negligence on three points. There was neglect to repair a broken support, and a brattice cloth was sited so that it obstructed the vision of a man giving signals to control the journey of trams. The jury also considered insufficient instruction had been given about riding below a certain point underground, and expressed concern at the number of men handling signals on the drift.

Coal Chartering

ALTHOUGH no particular volume of tonnage is reported fixed from Hampton Roads, recent charterings have shown some fluctuation in rates, but generally speaking the undertone of the market is reasonably steady. There is still no demand from the Roads to the Continent beyond an occasional opening to fix a re-let cargo, and on this basis 15,000 tons for April 20/May 5 has been taken for Antwerp-Rotterdam-Amsterdam at 25s. 6d. Subject to stem this might be repeatable. The rate to west Italy is not particularly steady following 16,000 tons being fixed for March at $4.10, whereas part-cargo of 10,000 tons for the second half of April has been fixed at $4.00 to Savona.

As far as Japan is concerned, charterers were able to secure about 10,000 tons for March/April at $7.75, but there is, however, a firmer tendency to Japanese destinations and April has now secured $8.00. Some improvement is also noted to South America with $5.90 now fixed for April/May to Rio and here charterers might be interested in contracting ahead. Hampton Roads/Yugoslavia reports $4.85 for 11,500 tons, March shipment.

Further tonnage has been arranged from Gdynia or Gdansk to Buenos Aires or La Plata, 9,500 tons for April 25/May 25 being fixed at 37s. and about 9,750 for May/June, also at this rate.

Fixtures from the UK are of a miscellaneous character. Wales/Sicily took spot coasting size at 30s. 6d., Cardiff/Las Palmas fixed 2,000 tons for early loading at 27s. 6d., and a part-cargo for prompt loading of 2,000 tons from Swansea to Takoradi at 42s. 6d. There are inquiries for coasting tonnage from Wales and also from the East Coast to Scandinavia.

Mr. Tom Holliday Nominated for NUM President

NORTHUMBERLAND Area president of the National Union of Mineworkers, Mr. Tom Holliday (47), has been nominated for the election to choose a successor to Mr. Ernest Jones, who is retiring as national president. A second election is necessary because of the death of Mr. Alwyn Machen, Yorkshire Area President of the NUM, who topped the recent poll but died before the result was announced.

Another nominee is Mr. Alex Moffat, vice-president of the Scottish Area, and he has also received the backing of the South Wales Area. Mr. Moffat is the brother of Mr. Abe Moffat, president of the Scottish Area.

The new election will be held towards the end of May, and nominations close on April 8.

Appointments

Development Engineer at Thorncliffe

PROJECTS development engineer in the engineering development department of Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, Mr. R. HALLAM has been appointed manager of the heating and ventilating department of the company's engineering division. Mr. Hallam joined Newton Chambers in 1937 as an apprentice draughtsman and in 1940 was transferred to the fuel economy section as a junior draughtsman. He became a designer draughtsman in 1942.

The following year he was promoted technical assistant to the fuel economy manager, in 1949 was appointed sales and contracts engineer (fuel economy), and became deputy chief engineer (development) in 1955. Two years later he left the company for an outside post, but returned after a year as projects engineer. He has been an associate member of the Institution of Mechanical Engineers since 1949 and of the Institution of Production Engineers since 1956.

Mr. J. NUTTING, lecturer in the Department of Metallurgy at Cambridge University, is to become Professor of Metallurgy at Leeds University.

Mr. L. D. HEDGES has been appointed manager of the branch office of the British Wagon Company, Limited, which opens at Enfield on Monday.

Mr. KINGSLEY M. MARLOW, works administrator for the past two years of Ex-Cell-O Corporation (Machine Tools), Limited, machine-tool makers, of Leicester, has been appointed production manager.

Mr. S. H. MAYSON has been appointed London manager of the Express Lift Company, Limited, of Northampton. The new London sales manager is Mr. E. C. WILLIAMS. Both appointments will take effect from April 1.

Mr. S. G. SPOONER has been appointed works manager of Marconi Instruments, Limited, St. Albans (Herts), with responsibility for manufacturing activities, industrial relations, works services, and welfare. He joined the company as production manager in 1955.

Mr. H. WOOTON has been appointed manager of the Fenhall and Lanchester drift mines (Co. Durham). He was manager of South Medomsley Colliery before being transferred to the production, and later planning, sections of the North-West Durham Area of the Durham Divisional Coal Board.

Mr. W. J. WYERS, for 18 years chief designer for Cannon Industries, Limited, ironfounders, makers of domestic gas appliances, etc., of Bilston (Staffs) has been appointed products assistant chief designer to the research and development department of Rubery, Owen & Company, Limited, Darlaston (Staffs).

Mr. ROY WALKER has joined Kelvin & Hughes (Industrial), Limited, as a specialist representative for North Wales, Yorkshire, and the northern parts of Lincolnshire and Derbyshire. Before joining Kelvin Hughes, Mr. Walker was a metallurgist with the UK Atomic Energy Authority, at Windscale.

Mr. DAVID RODDEN has taken up an appointment as manager of Blidworth Colliery in No. 3 (Edwinstowe) Area of the East Midlands Division of the National Coal Board. He is 39. After studying mining at Buckhaven Technical College, Scotland, Mr. Rodden worked at Wellesley Colliery (Fife). He returned to the mines in Scotland after war service in the RAF and in 1954 became undermanager at Clipstone Colliery (Notts). Later he worked at Rufford Colliery and in 1957 went to Ollerton Colliery, first as assistant and, later, as deputy manager.

Mr. W. H. EVERARD has been appointed deputy general manager of the foundry division of Edgar Allen & Company, Limited, Sheffield steelmakers, with Mr. J. M. T. LEVESLEY as his assistant. Mr. Everard was appointed to the boards of Park View Steel Works, Limited, Sheffield, and Aciéries d'Hirson, France, Edgar Allen subsidiaries, earlier this year.

Mr. L. G. FAIRHURST has been appointed technical director of Dowty Rotol, Limited. Under him there will be the Arle Court design department headed by Mr. A. A. J. WILLITT as chief engineer and the Staverton design department with Mr. E. DANVERS as chief engineer. The Arle Court design department will absorb the design activities of British Messier, Limited.

Mr. R. BEIGHTON, who has been appointed manager of Mossfield Colliery, North Staffordshire Area, West Midlands Divisional Coal Board, is at present manager of Berry Hill Colliery, in the same Area. Mr. Beighton went from the East Midlands Division to become undermanager at Glasshouse Colliery and was reserve manager in the North Staffordshire Area before taking up his present appointment. He succeeds at Mossfield Mr. H. J. Dennis, who is joining HM Mines Inspectorate.

Mr. ARTHUR EMLYN DAVIES, electrical engineer (construction) at the Wilton Works of Imperial Chemical Industries, Limited, has succeeded Mr. A. Cawley as electrical engineer with Newton, Chambers & Company, Limited, ironfounders, engineers, and chemical manufacturers, of Thorncliffe, near Sheffield. Mr. Davies started his career at Yorkshire Main Colliery, Edlington, near Doncaster, just before the war, becoming shift charge electrician underground. After service in the Merchant Navy he was appointed senior technical assistant of the Doncaster Area of the North-Eastern Divisional Coal Board in 1952. Two years later, Mr. Davies was promoted assistant chief electrical engineer of the Hickleton group in this Area before joining the ICI at Wilton in 1956.

Derwenthaugh Staiths Close

BECAUSE of the fall in shipments, Derwenthaugh Staiths, owned by the Durham Divisional Coal Board, will close tomorrow (Saturday). The reduced traffic can now be shipped more economically from nearby Dunston, the larger of the two staiths.

There are 26 board employees at Derwenthaugh Staiths. A divisional statement says that every endeavour will be made to find them suitable alternative employment.

Lord CHESHAM, Joint Parliamentary Secretary to the Minister of Transport, visited the Woolston and Northam yards, Southampton, of John I. Thornycroft & Company, Limited, on Thursday morning and later he visited the repair works of Harland & Wolff, Limited, and the British Transport Commission dry docks. Lord Chesham is making a series of visits to British shipbuilding areas at the request of the Minister. Today (Friday) he is to meet representatives of both sides of the industry to discuss shipbuilding and ship-repairing in Southampton.

Company News

Brown Bayley Group Raises Dividend

RISE of 1 per cent. to a final dividend of 9 per cent. making 12 per cent. for 1959, against 11 per cent., is announced by Brown Bayley, Limited. Group net profit rose from £160,264 to £189,118, after tax of £105,932 (£118.525) and a special credit of £8,455 (nil). The subsidiary, Brown Bayley Steels, Limited, is also raising its distribution and the Hoffman Manufacturing Company, Limited, the other subsidiary, is consolidating the 60th anniversary bonus of 5 per cent. paid for 1958 in its dividend and making a one-for-one free issue.

Profits of all three companies have increased. Brown Bayley Steels announces a final of 10¼ per cent. against 8 per cent., making 13¼ per cent. for 1959, compared with 11 per cent. Group net profit is £378,549 (£328,959) after tax. Final of 29½ per cent. is being paid by the Hoffmann Manufacturing Company, making 36 per cent. for the year—the 1958 total was 31 per cent. plus the anniversary bonus. Group net profits, after tax, expanded to £987,171 (£625,002).

MIDLAND ALUMINIUM COMPANY, LIMITED—Approval has been given to the increase in authorized capital and to the one-for-one rights issue at 9s. a share.

R. W. CRABTREE & SONS, LIMITED, printing machinery manufacturers, etc., of Leeds—Group profits rose from £304,001 to £375,947 in 1959 and the dividend is increased to 8 (7) per cent.

F. T. PRODUCTS, LIMITED, manufacturers of springs, etc., of Uxbridge (Middx)—Net profit rose sharply from £51,624 to £91,421 in 1959 and the dividend is raised to 35 (30) per cent.

WOLF ELECTRIC TOOLS (HOLDINGS), LIMITED—Group profits expanded from £182,846 to £277,326 for 1959, and the dividend on the £636,790 ordinary is 12½ (10) per cent. After heavier taxation, the group net balance is up from £86,003 to £137,326.

HALESOWEN STEEL COMPANY, LIMITED—There is a final dividend of 8 per cent., as forecast, on capital increased by a one-for-five scrip issue, making the total for 1959 equivalent to 11½ (10) per cent. Net profit was £40,313 (£17,430), after tax of £40,100 (£22,650).

H. J. BALDWIN & COMPANY, LIMITED, manufacturers of cable covers and electrical components, etc., of Bunny Hill (Notts)—No interim dividend is being paid for the year ending April 30, 1960. For the 19 months ended April 30, 1959, an interim of 10 per cent. was paid, but no final.

P. & W. MACLELLAN, LIMITED, structural engineers, etc., of Glasgow—After five years at 10 per cent. the dividend is raised to 12½ per cent. and there is also a special distribution of 3 per cent. (nil) from capital profits. Group profits contracted to £48,338 (£57,814) after tax of £20,481 (£27,781).

SHARPE & FISHER, LIMITED, distributors to the engineering, building and allied trades, of Cheltenham (Glos)—Dividend for 1959 is raised to 15 (10) per cent. by increasing the final payment to 10 per cent. from 7 per cent. A two-for-five scrip issue is proposed. Net profits were £74,556 (£50,940), after tax of £63,800 (£56,813).

GRANT LYON & COMPANY, civil engineers and railway contractors, of Scunthorpe—The Chamberlain Group of civil engineering and building construction companies, as part of its policy of continued expansion, has acquired the company. Mr. David Grant and Mr. Leslie Lyon will continue as joint managing directors of Grant Lyon.

BULPITTS (SWAN BRAND), LIMITED—Final dividend of 11½ per cent. is announced, making 16½ per cent. for 1959, against 15 per cent. previously. Group trading profit is £685,289 (£688,806).

BRADLEY & COMPANY, LIMITED, sheet metal and general galvanizers, etc., of Bilston (Staffs)—Following the acquisition of the equity shares in the company by W. P. Butterfield, Limited, manufacturers of transport and storage tanks, etc., of Shipley (Yorks), the accounting period is being extended to cover the 15 months to March 31, 1960.

CROMPTON PARKINSON, LIMITED—The company is to purchase from N. K. S. (Holdings), Limited, of Melbourne, that company's interest in Noyes (Australia) Proprietary, Limited. As a result, Noyes (Australia) will become a wholly-owned subsidiary within the Crompton Parkinson group and will continue to distribute its products throughout Australia.

GEORGE ANGUS & COMPANY, LIMITED, power transmission engineers, etc., of Newcastle-upon-Tyne—Final dividend of 10 per cent. makes 15 per cent., against 10 per cent. previously. The dividend was cut from 12½ per cent. to 10 per cent. in 1957. Group trading surplus rose from £406,000 to £766,000 and after tax, etc., the net balance is more than doubled at £372,000 (£162,000).

ALEXANDER STEPHEN & SONS, LIMITED, marine engineers, ship builders and repairers, etc., of Glasgow—The company announces a capital distribution of 2½ per cent., payable April 1, without deduction for tax, but there is no interim dividend for the year to March 31, 1960. No ordinary payments were made for 1958-59, against a 12½ per cent. dividend total for the preceding year.

JOHN G. STEIN & COMPANY, LIMITED, manufacturers of firebricks, refractories, etc., of Bonnybridge (Stirlingshire)—There is a final dividend of 5 per cent. making 10 per cent. for 1959. In view of the capital reconstruction in April, 1959, when the company was made public, the proposed final dividend is not comparable with the payment in the previous year. Net profit was £380,890 (£454,529).

SKEFCO BALL BEARING COMPANY, LIMITED, of Luton—Final dividend of 7½ per cent. is being paid on capital increased by a one-for-three scrip issue, making a total equivalent to 9½ per cent. on present capital for 1959, against the equivalent of 9 per cent. previously. There is a special jubilee bonus of 1½ per cent. payable from surplus in taxation account. Profit balance was £829,749 (£610,373) after tax.

JOSIAH PARKES & SONS, LIMITED, hardware manufacturers and non-ferrous founders, etc., of Willenhall (Staffs)—The dividend total is raised by 5 per cent. to 20 per cent., with a final of 14 per cent. for 1959. A one-for-two scrip issue is proposed for holders registered on April 8 of the existing £477,218 one-class capital. Group net profit increased to £186,402 from £151,268, after tax of £150,045 (£143,739).

BROWN BROS., LIMITED, merchants and makers of motor accessories, etc., of London, E.C.2—Group net profits expanded to £453,755 (£397,791) and the dividend is raised 2½ per cent. to 17½ per cent. Because of expanding business, the directors are also raising about £735,000 by a one-for-six rights issue at 45s. per £1 ordinary. The directors expect to maintain the dividend for 1960 on the proposed increased capital.

PARKINSON COWAN, LIMITED—Following the 5 per cent. interim, a final of 10 per cent., plus a 2½ per cent. bonus, is announced. This raises the total for the year

to 17½ per cent. from 12½ per cent. The previous year's payment included a special interim of 3½ per cent. After depreciation of £179,481 (£113,493), group trading profit was approximately doubled from £361,677 to £728,438. After tax, the group net profit is £281,184 (£199,502).

BLACK-CLAWSON INTERNATIONAL, LIMITED, pulp and paper making machinery manufacturers, of London, W.1—Group trading profits for the year ended September 30, 1959, advanced to £461,648 (£386,174) and the order-book at present stands at about £7,000,000. Two interim dividends each of £36,000 have been declared of which one has not yet been paid. Last November £300,000 was capitalized in a one-for-two scrip issue.

CHARLES CLIFFORD, LIMITED, manufacturers of metal sheet, tubes, etc., of Birmingham—Group capital expenditure last year totalled £79,904 and further expenditure of a substantial amount will be undertaken during the current year, states the chairman, Mr. Evan Ag. Norton. Group net profit for 1959 was £66,837 (£76,166) and the dividend is held at 10 per cent. Holders also received a 7½ (nil) per cent. net distribution last December.

TRIPLEX FOUNDRY, LIMITED, of Tipton (Staffs)—The directors announce that 776,475 of the rights issue of 800,000 5s. ordinary shares at 10s. each were taken up. The balance of 23,525 was more than covered by 225 excess share applications totalling 120,739 shares. These are being allocated on the following basis:—Up to 50, in full; 51 to 100, 50; 101 to 500, 100; 501 to 2,000, 200; 2,001 to 4,000, 300; 4,001 to 8,000, 400; over 8,000, 500.

MIDLAND IRON & HARDWARE COMPANY (CRADLEY HEATH), LIMITED—Holders of over 90 per cent. of the ordinary and over 85 per cent. of the preference stock had, up to Thursday of last week, assented to the scheme to exchange their stock in the company for stock in a new holding company to be known as Midland Iron Group (Cradley Heath), Limited, with the same trading interests. The scheme has now become unconditional as regards both classes.

A. & S. HENRY & COMPANY, LIMITED, holding company for brattice cloth and bag makers, etc., of Manchester—Final dividend of 21 per cent. is announced making 25 per cent. for the year. A tax-free dividend of 5 per cent. (absorbing £90,000) out of a capital profit of £94,000 is also recommended as a result of the sale of some small part of the property considered redundant. Trading profit rose from £727,693 to £898,800, and profit after tax was £451,865 (£314,398).

SOLAR INDUSTRIES, LIMITED—There has been a heavy demand for the 5s. ordinary shares of the company at 10s. 3d. per share placed by Neville Industrial Securities, Limited. The shares were made available only to members who were registered as holders of 50 or more Neville Developments ordinary shares on February 29. Holders of 50 shares participate in a ballot for 50 Solar Industries ordinary. Holders of 100 shares or more receive 100 Solar Industries ordinary for every complete 100 held.

G. D. PETERS & COMPANY, LIMITED, manufacturers of railway and road rolling stock equipment, etc., of Slough (Bucks)—The company sustained a net loss of £14,603 in the year to December 26, 1959, compared with a profit, after tax, of £101,698. The dividend is halved to 5 per cent., which the directors feel justified in recommending having regard to the substantial reserves built up out of past profits. They hope that the present setback is temporary and that it will be overcome by steps taken to recoup current losses and to develop additional products.

BARROW HEPBURN & GALE, LIMITED—Mr. George W. Odey, the chairman, gave an assurance that the position of the ordinary shareholders would be safeguarded in any plans to raise more capital to finance the company's new lines of development. He was replying to a shareholder at the annual meeting in London on Thursday of last week who asked the board to consider making a rights issue to the ordinary shareholders. As to the type of capital they would issue, Mr. Odey said that they would have to be guided by the condition of the market at the time of issue.

GENERAL REFRACTORIES, LIMITED, of Sheffield—The dividend is maintained at 20 per cent. for 1959 and group net profit rose from £303,471 to £408,229. The chairman, Mr. R. A. Kirkby, says the demand for many of the products is now back to or even in excess of 1957 peak levels. Capital expenditure in 1959 was lower than in recent years because in the face of uncertain market conditions the board decided not to enter into major capital commitments. The future is now much clearer and certain important projects have been started, including the provision of a tunnel kiln at Glenboig for the production of improved firebricks.

VILLIERS ENGINEERING COMPANY, LIMITED, makers of light internal combustion engines, etc., of Wolverhampton—Rights issue of 986,720 5s. ordinary shares at 20s. each is being made as a first stage in raising £2,000,000 for a four- to five-year development and modernization programme. The issue will be in the ratio of one-for-four ordinaries held or deemed to have been held, allowing for the debenture stockholders' entitlement. Turnover for the first six months of the year to July 31, 1960, is up nearly 30 per cent. over the first half of the previous year.

SPARK HOLDINGS, LIMITED—On the basis that the group's new acquisitions—Hall & Kay, Limited, T. R. Creffield & Son, Limited, and G. Hastings & Company, Limited—no more than maintain their current rate of earnings, the chairman, Mr. J. G. Lawson, expects group earnings in excess of £200,000 per annum. This is before tax, and is equivalent to 140 per cent. gross on the increased capital. The present financial period will be extended to cover the 13 months ending April 30, 1960, and an interim payment of 20 per cent. on the present £50,000 ordinary capital for the period is announced. The total dividend for 1958-59 was 25 per cent.

HADFIELDS, LIMITED, steelmakers, manufacturers of coal-mine equipment, etc., of Sheffield—The order-book stands at a higher figure than it has done for many years past, states the chairman, Lord Dudley G. Gordon. Not only does the increase in orders apply to the production of bars and billets in the rolling mills demanding an increase in steel melting, but also applies to some of the specialities for which the demand had fallen during last year. The increased order load has resulted in resumption of full-time working in most departments, though it does not seem likely that the demand for steel castings will reach the level of former years.

LAPORTE INDUSTRIES, LIMITED—The directors intend to recommend a final dividend on increased capital to be paid at the rate of 7½ per cent., which, with the interim dividend of 3 per cent. already paid, is equivalent to a total dividend for the year of 12 per cent. on existing capital. During the year ending March 31, 1960, the group has been reaping the benefit of certain long-term developments and also from capital invested in recent years. It is proposed to capitalize some of the reserves and make an issue to the ordinary shareholders of fully-paid ordinary shares on the basis of one new share for every five held. The new shares will rank for final dividend payable in July.

EVA BROS., LIMITED, manufacturers of forgings, of

Manchester—The company proposes a free scrip issue of one ordinary share for every five ordinary and "A" ordinary shares held. It is also proposed to convert the "A" ordinary into ordinary and, as compensation for ordinary holders, a simultaneous free scrip issue of one-for-10 is proposed. The board foreshadows a second interim dividend of 9 per cent. on the existing capital and a final of 7 per cent. on the increased capital for the year ending March 31, 1960, and a total dividend of 25 per cent. is foreshadowed for the year ending March 31, 1961. It is also proposed to change the company's name to Eva Industries, Limited.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED—Group net profit of £279,830 compares with £152,738 and the dividend is raised by the equivalent of 7 per cent. to 25 per cent. on a capital increased by a 25 per cent. scrip issue together with a further one-for-four scrip issue proposal. The chairman, Mr. F. C. T. Lane, says that trade continues to show healthy signs of technical development and expansion in all departments. Home trade increased in 1959 and sales so far this year are above those of the corresponding period last year. As a result of an intensive effort, direct export sales were roughly doubled in 1959 and continuing inquiries give considerable encouragement and hope for the years ahead.

Report on Instant Starter Engineering Not Revealed

CONTENTS of a report of investigating solicitors and accountants should not be divulged to shareholders, it was decided at a meeting on Monday of the shareholders' committee of the Instant Starter Engineering Company, Limited. Its chairman, Mr. T. E. Feather, said the committee recommended that the board should act on the report at once. He did not propose to go into further detail in the interests of shareholders.

The report covered the promotion of the company up to the annual meeting in December and the agreement with Simms Motor Units, Limited.

Mr. G. E. Liardet, former chairman of the company and chairman of Simms Motor & Electronics Corporation, Limited (parent company of the Simms Group), who protested that they should hear the contents of the report, was told by Mr. P. S. Brackenbury, chairman, and a member of the shareholders' committee, that it would not be in the best interests of the company to make negotiations public at this time. They were purely internal matters.

WIGGIN HIGH-ALLOY NICKELS EXHIBITION

EXHIBITION showing the properties and industrial uses of high-alloy nickels was opened on Monday by Henry Wiggin & Company, Limited, of Birmingham, a subsidiary of the Mond Nickel Company, Limited. Purpose of the exhibition, which lasts five days, is to help engineers and designers in the best use of these alloys.

The company is now engaged in building up its Hereford plant, where it is to concentrate all its activities now undertaken in three other plants. This development is expected to cost about £25,000,000. It will be substantially completed in 1963 and finished in 1965 and will raise the number of people employed by the company at Hereford to 3,500.

Rise in Industrial Stocks and Holdings

MANUFACTURERS' stocks of materials and fuels rose by £30,0000,000 in the final quarter of last year, compared with a fall of £115,000,000 in the last three months of 1958, according to figures published by the Board of Trade. Holdings rose by £85,000,000, despite substantial reductions in the comparable periods of the previous two years.

Much of this increase represented the rise in the value of work in progress and is evidence of higher production. Value of work in progress in the final quarter of last year rose by more than £100,000,000, whereas a year earlier the increase was only £30,000,000.

The value of finished goods in manufacturers' hands dropped by about £20,000,000 in the final quarter of the year. A year earlier there was a rise of £90,000,000. Wholesalers' holdings fell by £10,000,000, whereas in the two previous years the reductions had been £20,000,000 and £25,000,000.

Fixed capital spending by manufacturing industry was £218,200,000, about 8 per cent. less than in 1958. This was a slightly smaller reduction than occurred in any of the first three months of the year. Reduced spending on plant and machinery was the main reason for the drop in the final quarter and throughout the year. Fixed capital spending by other industries and services rose by 17 per cent. to £195,000,000.

Delta Metal Pays 2 Per Cent. More

WITH a final dividend of 7½ per cent. and a bonus of 5 per cent. for 1959, the Delta Metal Company, Limited, London, S.E.10, is raising its distribution by the equivalent of 2 per cent. to 17½ per cent. The year's distribution is payable on the ordinary capital as increased to £6,840,000 by the one-for-one scrip issue last April and the shares allotted in part consideration of the acquisition in July of E. P. Jenks, Limited, and Alfred Case & Company, Limited.

Group profits were £2,879,879 (£2,114,909) before tax of £1,413,666 (£1,043,057). The group total includes profits for five months from E. P. Jenks and Alfred Case & Company, amounting to £250,843 (before tax) and after charging £186,500 (£96,000) for base stock provision.

Tube Investments Acquires Fords (Finsbury)

CAPITAL of Fords (Finsbury), Limited, precision engineers, of Bedford, has been acquired by Tube Investments, Limited. It is stated that the advanced precision engineering products of this company, particularly in the field of high-speed equipment for capping bottles and forming other aluminium closures, provide close ties between the engineering and aluminium interests of TI and Fords (Finsbury).

Mr. R. E. Ford continues as chairman and the other directors remain in their present appointments.

Mr. JOHN FREDERICK BATEMAN, who was estates manager for the South-Western Divisional Coal Board for the past six years, has died at the age of 59.

Obituary

MR. H. G. RAMSELL

THE death has taken place at Wolverhampton of Mr. Harold Gilbert Ramsell, general manager of the Yale & Towne Manufacturing Company, Limited, locksmiths and makers of materials handling plant, etc., of Willenhall (Staffs). He was 61. He joined H. & T. Vaughan, Limited, in 1919 and shortly after the company was taken over by Yale & Towne he was appointed works manager. He became general manager six years ago and when the company acquired the Willenhall locksmiths, E. Tonks & Sons, Limited, he was appointed its new managing director.

He had made many visits to America on behalf of the firm and was well known in this country for his lectures on locks. He was a member of the Institution of Mechanical Engineers and of the Institute of Production Engineers and had lectured frequently at Wolverhampton and Staffordshire Technical College on production engineering.

MR. JOHN WOLSTENHOLME

PRESIDENT of the Walmsley (Bury) Group, Limited, one of the world's largest manufacturers of pulp and paper making machinery, Mr. John Wolstenholme died on Thursday of last week at the age of 80. On the grounds of age he relinquished the chairmanship of the group 10 years ago, but remained an ordinary director of all the companies within the group.

He had been with the firm, then Charles Walmsley & Company, Limited, since leaving school 66 years ago and had worked his way through every department, eventually being appointed managing director. When the group was formed 30 years ago he became its first chairman. On leaving Lancashire in 1946 to live in Sussex he presented his home, Walshaw Hall, to Masonic charities for aged freemasons.

Mr. ALEXANDER MATHER, who died on Sunday, was a chartered accountant and a director of Brown Bros. & Company, Limited, hydraulic engineers, brassfounders, etc., of Edinburgh.

Mr. ERNEST A. FOSTER, who joined the staff of Stewart & Craig, Limited, engineers, boilermakers, and shiprepairers, etc., of Hull, in 1920 and became assistant manager, has died at the age of 70.

Mr. JOHN BODDY, chief engineer and technical manager of Trico-Folberth, Limited, motor-car equipment manufacturers, of Brentford (Middx), died on Wednesday of last week after a short illness.

The death has occurred at the age of 80 of Mr. JAMES EDWARDS, who from 1938 to 1950 was president of the Yorkshire Area of the National Association of Colliery Overmen, Deputies, and Shotfirers.

Mr. BENJAMIN PRICE, a director of John Thompson Castings, Limited, a subsidiary of John Thompson, Limited, steel and iron workers, etc., of Wolverhampton, has died at the age of 43. He joined the firm when he left school 29 years ago.

Mr. CHARLES EDWARD TEAGUE has died at the age of 68. After leaving school he entered his father's business, Teague & Chew, Limited, engineers and ironfounders, etc., of Cinderford (Glos), which he later took over and carried on with his son.

The death has taken place at the age of 78 of Mr. JAMES S. CLAPHAM, formerly secretary of Thomas Robinson & Son, Limited, woodworking, flour and provender milling engineers, of Rochdale. He joined the firm in 1904, became secretary in 1924, and retired in 1951.

The death took place on Tuesday of Mr. STANLEY DAWSON CASEBOURNE, senior partner of Casebourne & Turner, consulting marine engineers and ship surveyors, Liverpool. He was 79. He was a founder member of the Society of Consulting Marine Engineers and Ship Surveyors.

The death has occurred of Mr. JAMES EDWARD OSBORNE, who retired in 1949 after 56 years' service with Newton Chambers & Company, Limited, of Thorncliffe, near Sheffield. He was 81. Mr. Osborne worked at Smithy Wood coke ovens, the ironworks, and the Norfolk works.

The death occurred last week at the age of 67 of Mr. HUBERT SENIOR, undermanager at Haigh Colliery, Huddersfield, for 11 years before his retirement in 1958. He had been in mining for over 50 years and was manager at Shuttle Eye Colliery for 23 years before moving to Haigh Colliery.

Mr. WILLIAM BUCHANAN, for 30 years chief production engineer of G. & J. Weir, Limited, engineers and founders, etc., of Glasgow, has died at the age of 68. He joined the firm as an apprentice and had completed over 50 years' service when he retired two years ago. In 1949 he was made MBE.

Mr. ARTHUR PRESTON, for a number of years a director and secretary of W. H. Davis & Sons (Wagons), Limited, makers of railway rolling stock, of Mansfield (Notts), has died at the age of 69. He began his career with the old London & North Eastern Railway Company and joined W. H. Davis & Sons 54 years ago at Doncaster.

The death has occurred of Dr. HERBERT STANSFIELD, Professor of Physics and Electrical Engineering at University College, Southampton, from 1912 to 1932. At the turn of the century Dr. Stansfield was for six years head of the physics and electrical engineering department at the Municipal Technical School, Blackburn, and in 1904 was appointed honorary research Fellow and later Lecturer in Physics at the Victoria University, Manchester.

Combustion Engineering Association

OFFICERS of the Combustion Engineering Association for 1960-61 are:—President, Mr. N. A. McNeill, Unilever, Limited. Vice-presidents, Mr. S. P. Chambers, a deputy chairman of Imperial Chemical Industries, Limited; Sir John Charrington, chairman of Charrington, Gardner, Locket & Company, Limited; Mr. G. D. Elliott, John Thompson (Australia) Pty., Limited; Mr. H. C. Hawkins, British Xylonite Company, Limited; Sir Percy Sanders, deputy chairman of Davey, Paxman & Company, Limited; Mr. R. H. E. Thomas, marketing and supplies member of the National Coal Board; and Sir Edward Thompson, chairman and managing director of John Thompson, Limited. Council chairman, Mr. M. S. Gaskill, West's Gas Improvement Company, Limited. Honorary treasurer, Mr. E. W. Barnes, Riley (IC) Products, Limited.

The president, chairman, Mr. Chambers, and Mr. Vigers are newly appointed.

NEWS IN BRIEF

AS FROM APRIL 1, the telephone numbers of the Hull branch of British Insulated Callender's Cables, Limited, will be Hull 24470 and 28367.

FACTORY is being constructed at Harleston (Norfolk) at a cost of £500,000 for Rotary Hoes, Limited, for the manufacture of agricultural machinery.

THE BOARD of Metal Industries, Limited, has sent a donation of £100 to the British Red Cross Society for aid to the victims of the Agadir earthquake.

MUREX WELDING PROCESSES, LIMITED, Waltham Cross (Herts), is to hold a welding exhibition at the works of Specialloid, Limited, Leeds, from April 5 to 9.

NEW five-litre six-cylinder industrial diesel engine, capable of adaptation to tractor shovels, fork-lift trucks, mobile cranes, and other plant, has been developed by Perkins Engines, Limited, of Peterborough.

METAL BOX COMPANY, LIMITED is to lease a 23,000-sq. ft. factory on the Newburn Industrial Estate at Newcastle-upon-Tyne for the manufacture of plastic containers. It will employ about 100 people.

CONSTRUCTION of three new major plants at the £30,000,000 Grangemouth works of British Hydrocarbon Chemicals, Limited, the joint subsidiary of British Petroleum and Distillers, Limited, will cost £5,000,000.

THE DUKE OF EDINBURGH was entertained at luncheon by the chairman and directors at the headquarters of Leo Computors, Limited, London, W.14, on Tuesday, after visiting the company's workshops and development laboratories.

FOR THE TENTH successive year members of the Hebburn shipyard Ambulance Corps of Hawthorn Leslie (Shipbuilders), Limited, have gained a 100 per cent. sucess in the St. John Ambulance Brigade first-aid examination.

IN CONJUNCTION with its Nigerian agent—West African Engineering Company (Nigeria), Limited—British Ropes, Limited, Doncaster, has formed a subsidiary company in Lagos, Nigeria, under the name of Nigerian Ropes, Limited.

UNDER AN AGREEMENT reached between the employers and unions the working week in the light castings industry will be reduced from 44 hours to 42 without loss of pay as from Monday. Adjustments are to be made in rates for pieceworkers.

FRENCH STEEL PRICES are to be raised by an average of 8 per cent. as from the end of March. The increase aims to halve the difference between west German prices, now from 16 to 16½ per cent. higher than those in France, and current French prices.

AFTER 56 YEARS with Williams Brothers (Sheffield), Limited, brassfounders and engineers, etc., Mr. Albert Kilner, a foundry foreman, has retired. The managing director, Mr. Desmond H. Williams, made a presentation on behalf of the staff and colleagues.

SOLE AGENCY in the UK for Heraeus Quarzschmelze, GmbH, Hanau, West Germany, makers of high-quality fused quartz for industrial and laboratory applications, has been taken over by the Hanovia Lamps division of Engelhard Industries, Limited, of Slough.

ONLY SIX MONTHS after the order was placed by the Co-operative Farm Chemicals Association, of Kansas, the Chemical Construction Corporation of New York completed and placed "on stream" a $1,250,000 nitric acid plant with a rated capacity of 120 tons per day.

ALUMINUM COMPANY OF CANADA, LIMITED, plans to spend $2,000,000 on plant improvement at its smelter at Arvida, Quebec. The programme will include the installation of two new furnaces for the treatment of aluminium metal and two giant saws for cutting ingots. The overall capacity will not be increased, but the new equipment will enable the company to offer a wider variety of shaped and semi-prefabricated products.

NEARING COMPLETION at the Birkenhead shipyard of Cammell Laird & Company (Shipbuilders & Engineers), Limited, is the largest space heating system in Britain. It heats a working area of 11 acres of plating and welding bays using overhead radiant gas heaters. Two thirds of the installation is already in operation.

APPRENTICES of Vickers Armstrongs (Shipbuilders), Limited, D. Garrett, J. Nicholson, and G. Sleigh, who gained distinctions in the 1959 examinations for the Higher National Certificate in shipbuilding and naval architecture, have been presented with cheques by Mr. George H. Houlden, managing director of the firm.

LORD STRATHCLYDE, chairman of the North of Scotland Hydro-Electric Board, announced in Glasgow on Monday that Radiation, Limited, is to establish a new factory at Peterhead. The factory, which is sited in one of Scotland's worst unemployment areas, will produce electrical appliances and is expected to be ready within six months.

NEW COMPANY—United States Underseas Cable—has been formed jointly by Phelps Dodge, Northrop and its subsidiary, Page Communications Engineers, and Felten & Guilleaume, of west Germany. The president of the new company is Mr. Howard T. Brinton, the president of a wholly-owned wire and cable making subsidiary of Phelps Dodge.

IMMEDIATE EXPANSION PROGRAMME is being undertaken by Titan Manufacturing, Limited, a subsidiary of Broken Hill Proprietary, Limited, steelmakers, mine owners, etc., of Australia. Initially the scheme will cost £A400,000 and will include building new shops at the Newcastle factory for the manufacture of tools used in the mining industry.

TWO OF AUSTRALIA'S largest tyre makers, Dunlop Rubber Australia, Limited, and Olympic Consolidated Industries, Limited, have formed a new company with Ralph McKay, Limited, to make truck wheels and rims. It will be called Wheels & Rims Australia Pty., Limited, and will have an initial capital of £A250,000 to be held equally by the three partners.

OFFER HAS BEEN made by Standard-Triumph International, Limited, to the 120 men dismissed last week when its subsidiary, Mulliners, Limited, suddenly closed the Tile Hill works, Coventry. The men have been promised jobs or pay at consolidated time rates. The unions concerned are satisfied with the outcome of their discussions with the management.

ABOUT A QUARTER of the effort of the National Engineering Laboratory at East Kilbride is devoted to subjects applicable to the design of machine tools, said the Minister of Education, in a written reply to Mr. Austen Albu (Lab.). The Minister added that the specific applications of the results are being undertaken in collaboration with several industrial firms.

INTERNAL COMBUSTION engines used for industrial works and using liquefied petroleum gases were demonstrated in Manchester on Tuesday by Shell-Mex & B.P. Gases, Limited. It is claimed that this fuel reduces carbon monoxide fumes, saves fuel costs, gives longer engine life with less maintenance, and uses less oil than a normal petrol engine.

MERSEYSIDE AND NORTH WESTERN SECTION of the Institute of Marine Engineers has elected Mr. D. S. Tod chairman and Mr. L. Deakin vice-chairman for

the ensuing year. Mr. Tod is joint managing director of Chas. Howson & Company, Limited, shiprepairers and engineers, etc., of Liverpool, and Mr. Deakin is deputy repairs manager for Cammell Laird & Company (Shipbuilders & Engineers), Limited, Birkenhead.

AGREEMENT FOR the supply of natural uranium fuel elements for the Japanese nuclear power station to be built at Tokai-Mura has been signed by Mr. D. Yasukawa, president of the Japan Atomic Power Company, and Sir Roger Makins, chairman of the United Kingdom Atomic Energy Authority. Contract for the station, due to start operating in 1964, was won last December by the General Electric Company, Limited.

SANDVIKENS JERNVERKS, AB, producers of high-quality steel, announces a net profit of Kr. 6,800,000 ($1,320,000) for 1959, as against Kr. 5,600,000 for 1958. The unchanged dividend of Kr. 8 on the share capital, which was increased from Kr. 80,000,000 to Kr. 83,170,000 last year, corresponds to a total dividend of Kr. 6,650,000 (Kr. 6,400,000). Sales were up from Kr. 235,000,000 to Kr. 276,000,000, including a rise for exports from Kr. 149,000,000 to Kr. 186,000,000.

NEW COLD ROLLING MILL is to be erected at a cost of £4,000,000 to £4,500,000 at the Norsk Blikkvalseverk, at Simonsvik, near Bergen, a rolling plant belonging to the Norsk Jernverk concern. Equipment for the mill is to come mainly from Britain. It will cover home and possibly some export demand when it comes into operation towards the end of next year. Last year the Simonsvik plant produced 30,000 metric tons of rolled products, as against 16,000 tons in 1958.

City to Aid New Zealand Steel Project

RAISING of £75,000 of fixed interest capital to help finance Pacific Steel's project in New Zealand is planned by a group of City institutions, headed by a leading merchant bank and including the Commonwealth Development Finance Company, Limited. The greater part of the £3,500,000 involved would be covered by this debenture capital with £1,650,000 of equity.

Fletcher Holdings, Limited, a New Zealand company, will own £550,000 of the ordinary capital and other New Zealand interests £440,000, thus ensuring local control. Of the remaining £660,000, Colvilles, Limited, Stewarts and Lloyds, Limited, and Guest, Keen & Nettlefolds, Limited, will each take equal shares.

Sir Eric Harrison Visits New BICC Factory

VISIT to the power cables division of British Insulated Callender's Cables, Limited, at Erith (Kent), was made last Friday by Sir Eric Harrison, High Commissioner for Australia. Sir Eric toured the new factory and high voltage laboratory with its facilities for the manufacture and testing of high and low voltage power cables.

BICC is currently engaged on an Australian contract for the manufacture, supply, and installation of 330 kV cables for the T2 power station of the Snowy Mountains Hydro-Electric Authority.

The High Commissioner was welcomed to Erith by Mr. D. W. Aldridge, deputy chairman, and Mr. O. W. Minshull, general manager of the power cables division.

Coal—"The Basic Fuel for Years"

COAL will be the basic fuel for years ahead despite competition from oil and atomic power, said Mr. E. W. Lane, general manager of No. 1 (Worksop) Area of the North-Eastern Divisional Coal Board in an address at the annual dinner on Saturday of the Worksop branch of the National Union of Mineworkers, Colliery Officials and Staffs Area.

Mr. Lane spoke of the board's coal stocking policy, which, he said, kept hundreds of men in jobs. It was realized that stocking could not go on for ever and the decision was made to close certain pits and transfer men to pits where coal was more easily sold. "There were no closures in this Area or division," said Mr. Lane. "There have been transfers on a comparatively small scale, but our division will be an expanding one and I hope nobody will be fearful, or have any idea that our industry is completely finished. With proper treatment the patient is rapidly recovering and has already gone well past the convalescent stage."

Mr. R. Smith, regional officer of No. 2 region, said that as a matter of policy, the board had decided to ask divisions to consider the application of electronic data processing. A team had been set up in the North-Eastern Division to investigate possibilities of wage computation. Mr. Smith said it could not be too strongly emphasized that the process of transferring to it must be long, gradual, and progressive, even assuming that the installation would be established.

He described it as a revolutionary project and a difficult problem because of the redeployment which would come about in the changeover. A meeting would soon take place with the director of staff and the finance director to study its implications.

Divisional Coal Boards' First-aid Contests

DEAN and Chapter Colliery "A" team won the South-West senior first-aid competition of Durham Divisional Coal Board at Tursdale at the weekend and qualified for the Durham divisional finals on May 14. Runners-up were Thrislington Colliery team. The prizes were presented by Mr. N. F. Nattrass, industrial relations director of the division.

Haunchwood Colliery won the West Midlands Divisional Coal Board's competition with 529 points, at Nuneaton on Saturday. Birch Coppice Colliery was second with 496 points and Arley Colliery third with 416½ points.

Betteshanger Men Re-engaged

WITHIN two weeks of the end of the stay-down strike at Betteshanger Colliery, Kent, 27 of the 140 men dismissed as redundant were re-employed, Mr. Edward Smith, secretary of the South-Eastern Divisional Coal Board, said this week.

"Since the strike, wastage has been very heavy indeed," he said. "If the rate of wastage continues we shall be obliged to recruit a few more."

HEAD OFFICE of Wagon Repairs, Limited, is now at P.O. Box 319, Imperial House, Bournville Lane, Birmingham, 30 (telephone: PRIory 5151).

Personal

Part-time Members of Iron and Steel Board

THE Minister of Power has appointed Sir THOMAS WILLIAMSON and Mr. HARRY DOUGLASS to be part-time members of the Iron and Steel Board with effect from June 1, 1960. Sir Thomas is general secretary of the National Union of General and Municipal Workers and a past-chairman of the TUC and of the British Productivity Council. He succeeds Sir Andrew Naesmith.

MR. HARRY DOUGLASS

Mr. Douglass is general secretary of the Iron and Steel Trades Confederation and has served on many Government committees of inquiry. He is a member of the TUC general council and of the Council for Scientific and Industrial Research. He follows Mr. Jack Owen, former general secretary of the National Union of Blastfurnacemen, Ore Miners, Coke Workers, and Kindred Trades and member of the general council of the TUC.

Prof. R. G. S. HUDSON, formerly Professor of Geology at Leeds University, has been appointed Iveagh Research Fellow in the Department of Geology of Dublin University.

Mr. JOHN R. BERGNE-COUPLAND, a works director of Ruston & Hornsby, Limited, engineers and iron-founders, etc., of Lincoln, has been appointed High Sheriff of Lincolnshire.

Cllr. CHARLES E. WEBB (65), Mayor-elect of the borough of Merthyr Tydfil, is a colliery surface worker at the Merthyr Vale Colliery. In 1955 he was awarded the BEM for industrial services.

Mr. FRED W. BROOMHEAD, chief mechanical engineer of the Doncaster Area of the North-Eastern Divisional Coal Board, is to retire at the end of the month after 50 years' service in the industry.

Mr. C. L. ROUND, until last August manager of Grassmoor Colliery (Derbyshire), received a presentation on behalf of the staff and officials at the annual staff dinner. Mr. Round is now manager of Markham No. 1 Colliery.

The Minister of Power has appointed Mr. W. K. HUTCHISON, deputy chairman of the Gas Council, a member of his Scientific Advisory Council in succession to Sir Henry Jones, who has retired on his appointment as chairman of the Gas Council.

Mr. E. G. JONES, technical manager of Pollard Bearings, Limited, has left Britain on an extensive tour of the company's branches, agents, and oversea customers. He will visit Bombay, Singapore, Australia, New Zealand, Canada, and America.

Former miner Mr. JAMES EVAN WILLIAMS, was elected chairman of Breconshire County Council last Friday. He worked underground for 48 years, first at the Diamond Colliery, Ystradgynlais, and after it closed in 1935 at Ynyscedwyn Colliery.

Sir CECIL WEIR has been appointed chairman of the export panel of the British Standards Institution. He is chairman of International Computers & Tabulators, Limited, and succeeds Mr. J. L. S. STEEL, export director of Imperial Chemical Industries, Limited.

Mr. HERBERT MORLEY, general works' manager of Samuel Fox & Company, Limited, steelmakers and rollers, of Stocksbridge, near Sheffield, and Mr. A. CROSSLEY, manager of the firm's wire department, have left for the USA to study developments in special wire production.

Mr. NOEL NEWSOME has been appointed director of Harry Ferguson Research, Limited, where he will be responsible for the world-wide commercial development of all Ferguson inventions. Mr. Newsome was director of public relations, National Coal Board, before he joined Harry Ferguson in 1948.

SIR LESLIE GAMAGE, chairman and managing director of the English Electric Company, Limited, has been re-elected as president of the British Electrical and Allied Manufacturers' Association. Mr. W. K. G. ALLEN has been re-elected chairman of the council for the current year and Mr. A. M. BROWNE has been re-elected chairman.

Presentations were made last Friday by Mr. J. WHEELAN, works' safety officer of Samuel Fox & Company, Limited, steelmakers and rollers, of Stocksbridge, near Sheffield, to Mr. CHARLES DODSON, chief officer of the works' fire brigade, and to his deputy, Mr. R. WATTS, on their retirement. The new chief officer, Mr. R. RUTLAND, presided.

A COMMISSION OF INQUIRY has been set up by the Nigerian Government to inquire into the problems of the Nigerian coal industry. Powell Duffryn Technical Services, Limited, has agreed to second its chief coal mining engineer, Mr. J. T. B. WELBOURN, to serve as the technical member on the commission. The inquiry opened at Enugu on Monday.

Mr. W. M. T. BOBY, managing director of William Boby & Company, Limited, specialist water treatment engineers, of Rickmansworth (Herts), has been awarded the bronze medal of the Institution of Public Health Engineers for his paper "Desalting of Saline Waters by Electrodialysis" which was judged the best recorded in the institution's journal during 1959.

The honorary degree of Doctor of Laws of Edinburgh University is to be conferred on Prof. ARTHUR HOLMES, FRS, on July 7. Prof. Holmes was Regius Professor of Geology at Edinburgh University from 1943 to 1956, when he became Professor Emeritus. He was awarded the Wollaston and Penrose medals in 1956 and is well known among leading American and continental geological societies.

Making a presentation to Mr. W. R. T. FARMER, who recently retired as manager of the No. 1 Area Workshops, East Midlands Divisional Coal Board, Mr. N. Siddall, Area Manager, said that Mr. Farmer's work had played no small part in the fact that the workshop was recognized as one of the foremost institutions of its kind in the British mining industry. Mr. Farmer was Area stock controller before becoming manager of the workshops in 1951.

Mr. E. N. GRIFFITH has been elected vice-president of the British Engineers' Association, after having served on its governing council for the past 10 years as representative of the Agricultural Engineers' Association. Mr. Griffith who was president of the Agricultural Engineers' Association from 1948 to 1954, is chairman and joint managing director of Rotary Hoes, Limited, West Horndon (Essex), and a governor of the National College of Agricultural Engineering.

MR. SYDNEY BLEWITT, a director of John Thompson, Castings, Limited, and a deputy director and chief

cashier of John Thompson (Wolverhampton), Limited, both members of the John Thompson, Limited, group, is to retire on March 31, after 51 years' service with the group. Mr. Blewitt began his career as an office boy and has seen the organization's payroll grow from 400 to its present 9,000 employees. He is succeeded by MR. H. J. RANDALL.

Recently appointed managing director of the engineering group of the General Electric Company, Limited, Mr. R. N. MILLAR is to visit India to investigate prospects for British nuclear power plant exports. He leaves tomorrow (Saturday) and will be accompanied by Mr. P. A. LINDLEY, chief engineer of GEC's atomic energy division. Mr. Millar, who signed on behalf of the company the £20,000,000 contract for the construction of Japan's first nuclear power station, hopes to hold informal discussions with Dr. Homi Bhabha, chairman of the India Atomic Energy Commission.

Permission for Limited Work at Clydesdale (SA) Pit

PLANS to resume coal production at Clydesdale Colliery, Coalbrook, South Africa, where 435 miners perished in a pit disaster in January, cannot be implemented at this stage, says a statement by the management. However, it is understood that permission has been granted to start work again in Clydesdale North for limited operations. At Clydesdale South, permission has been given for operations in only about one fifth of the underground workings.

Coal supplies from other areas to the Highveld and Taaibos power stations have improved to such an extent that all power cuts in the Far West Rand and Orange Free State areas have been restored. The power cuts had caused serious losses to gold mines in the area. In some mines, according to the Chamber of Mines, the loss in production "considerably exceeded" 43 per cent., in view of the necessity to maintain pumping, ventilation, and other essential services.

Between 200 and 300 of the 4,000 African mine workers there have left the pit because they believed the pit would close permanently after the disaster. The European complement there is 250.

Miner Who Retired too Soon

MINER with 55 years' service behind him has missed a £203 National Coal Board retirement gratuity because of a mistake by an official of the National Union of Mineworkers. The man, Mr. Joe Moore (69), who worked at Brookhouse Colliery, Beighton, near Sheffield, has since been told that he failed to qualify for the gratuity by only a week.

He commented: "If I had known another week's work would have brought me the gratuity, I should have stayed. I just took the advice of a union official. All I have to show for all my years of service now is the certificate and a pension of 28s. a week."

Mr. John Bishop, NUM branch secretary at the pit, said: "I told Mr. Moore to wait before retiring, but then I went into hospital and one of my deputies later told him it was useless waiting for the money." He added: "We have tried to get Mr. Moore his gratuity, but the Coal Board will not agree."

TELEPHONE NUMBER of the service department of Research & Control Instruments, Limited, of London, S.W.12, is now BATtersea 8641.

ECSC Secret Report on Coal Production Costs

PROVISIONAL report on coal-mining production costs and other burdens has been prepared by the High Authority of the European Coal and Steel Community. The Authority has promised to put the report at the disposal of the European Parliament Assembly on a strictly confidential basis. The report deals particularly with the Belgian coal-mining industry and also contains sections on the Ruhr, based on 1958 figures, and the West German Aix-la-Chapelle area. A further report on industrial reorganization within ECSC is due from the Authority soon.

French steel industries claim to have lost several million (new) francs in the past 10 years as the result of special tariffs imposed by German Railways on transport of Ruhr coal and coke to Lorraine. The rates for Lorraine transports are 24 per cent. higher than for internal German routes.

High Authority president Signor Malvestiti will meet Dr. Adenauer on April 7. They will discuss the Ruhr coal marketing scheme, a subject which the German coal employers' leader, Dr. Burckhardt, has broached with the High Authority.

Plans to tax fuel oil submitted by the Federal German Government more than a year ago to help the coal industry have been delayed again this week. The Bundesrat (Upper House) refused to accept the Bill as it emerged from the Bundestag.

Coal production in Germany last week (with output for the first week in March and the second March week of 1959 in parentheses) was as follows:—Hard coal, 2,724,300 (2,590,900 and 2,680,300) tons; coke, 699,000 (698,300 and 673,400) tons.

His Worship Stranded Down a Mine

MAYOR and Mayoress of South Shields, Ald. and Mrs. T. W. Peel, were stranded 700 ft. underground at Westoe Colliery (Co. Durham) on Tuesday—all because a coal wagon was derailed. The civic party, which included the town clerk and several aldermen, waited for a lift to the surface as men struggled to move the wagon from the cage.

It happened at the end of an underground trip, during which the party saw men at work. When they returned to the bottom of the shaft, a telephone call was made to the surface, but the party had to wait for 10 minutes before they could leave.

More Help for Pensioners from Yorkshire Miners

YORKSHIRE members of the National Union of Mineworkers face an increase soon of 6d. to 2s. in their weekly subscriptions in order to maintain payments to retired members. The Area general secretary, Mr. F. Collindridge, said this step was necessary because the new scheme of compulsory retirement at 65 meant an increase of 3,000 retired miners by the end of the month and considerably more by 1961.

The increase in subscription will bring in a further annual sum of about £160,000. At present, more than £120,000 is being paid each year to 11,000 pensioners in Yorkshire.

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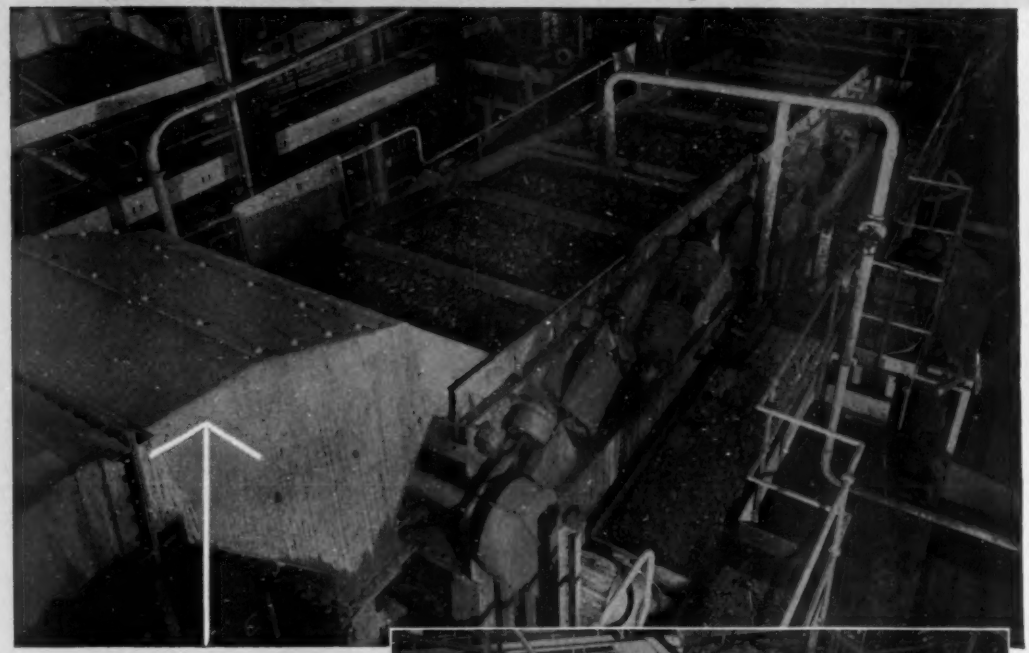

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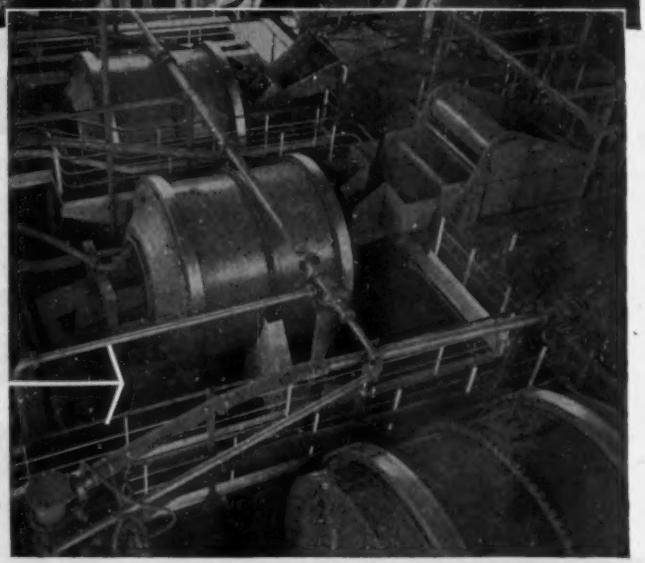
SCREENS

Run-of-mine scalping. Raw coal pre-sizing. Washed coal dewatering/sizing. Dense medium drain and spray. Final sizing. Slack and slurry dewatering. Coke scalping, grading and debreezing.

Photograph of Flämrich Screens by courtesy of the National Coal Board



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CL21

Non-ferrous Metals

Contrast in UK and US Copper Markets

STOCKS of copper in London last week dropped a further 525 tons and now stand at the low figure of 2,372 tons. This is a sustaining feature of the London market and has materially helped to hold up the London price levels. Demand is satisfactory and the outlook is for present price levels to be maintained or even edge higher so long as stocks do not rise rapidly.

The situation here is very different from that in the US where activity can only be described as slow. Indeed, demand is well below expectations and the custom smelter intake price for scrap has been reduced by a further 1 cent a pound to 23½ cents—equivalent to slightly less than 30 cents a pound for electrolytic copper in three months' time. This price compares with the present quotation of 33 cents a pound applicable to both custom smelters and producers.

The outlook is therefore for a further weakening of the US price structure in the near future. This would, of course, have its repercussions in London, but unless actual physical supplies on this side of the Atlantic increase rapidly the price decline in London, when it comes, will be gradual.

Tin is a generally firm market. The International Tin Council's explanation that the increase in the next quarter's quota was made because a producing member (now known to be Bolivia) cannot meet its quota was a bullish factor. It is also rumoured that Indonesia may experience difficulty in meeting its quota. However, overall demand is satisfactory and the outlook is for present price levels to be maintained. Stocks in London are falling gradually and at the end of last week stood at 7,900 tons. In the US the market is easier and the price has been fluctuating around $1 a pound.

Lead is a better market in London than in New York, where the price is unchanged at 12 cents a pound. In London demand is good and the price is now around £78 a ton.

Zinc is enjoying better trading conditions with consumer demand pressing on a market none too well supplied with metal. The London price is now around £91 a ton. In the US the East St. Louis spot price is unchanged at 13 cents a pound.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £253 10s., forward £238. TIN, Standard: Prompt £785 10s., forward £785. LEAD: Prompt £77 10s., forward £76 15s. ZINC: Prompt £92 17s. 6d., forward £89.

To Direct Collective Research and Engineering of S. Smith & Sons (England)

WHILE retaining the managing directorship of the divisions of S. Smith & Sons (England), Limited, Mr. G. B. G. Potter is now to direct the collective research and engineering facilities of the divisions. Mr. K. Fearnside has been appointed director of research and engineering of Smith's Aircraft Instruments, Limited, and as such will be directly responsible to Mr. Potter.

Mr. G. G. Roberts remains technical director of Smith's Aircraft Instruments, Limited, and he will assist Mr. Fearnside in his new appointment.

Ore Chartering

FIXTURES in the near trades and from the Mediterranean do not show any particular improvement as regards volume, and rates show little or no material change. Nothing has recently been reported from the North Africa coast to the Continent and there is no appreciable demand for the large carriers.

Bauxite has been fixed from Toulon to Newport at 23s. for about 11,500 tons, prompt loading, and 4,500 tons from Itea to Caronte for March/April at 24s. 6d. on gross terms. Interest is maintained for forward loading from Toulon to South Wales. From North Spain, Pasajes to Bremen reports 18s. 6d. for 2,400 tons, March, and 3,700 tons, Bilboa/Rotterdam or Dordrecht, for May loading at 18s. f.i.o. The Swedish market to the UK still appears to be inactive and nothing is quoting from Narvik to this side. Narvik/Poland has, however, taken 10,000 tons, March, at 13s. f.i.o. and also paid this rate for 14,500 tons for April shipment.

In the phosphate section Casablanca/Galway recently fixed 1,800 tons for spot loading at 44s., and 19s. 9d. has been paid for 9,500 tons, March, for Holland discharge. Casablanca/Cape Town or Durban arranged 9,800 tons for March 25/April 15 at 38s. 6d. with the option of Lourenço Marques or Beira at 41s. There is some interest from Huelva to this side with pyrites and recently 3,000 tons for March 22/April 5 was taken for Hull at 40s. and from Morphou Bay 9,500 tons to Immingham direct for March/April at 40s. Similar rate and position has been fixed to Hull or Immingham. Morphou Bay/Rotterdam paid 28s. 6d. for 10,000 tons April 15/May 10.

Galveston sulphur to Immingham or Tees has fixed 11,500 tons for March/April at 52s.

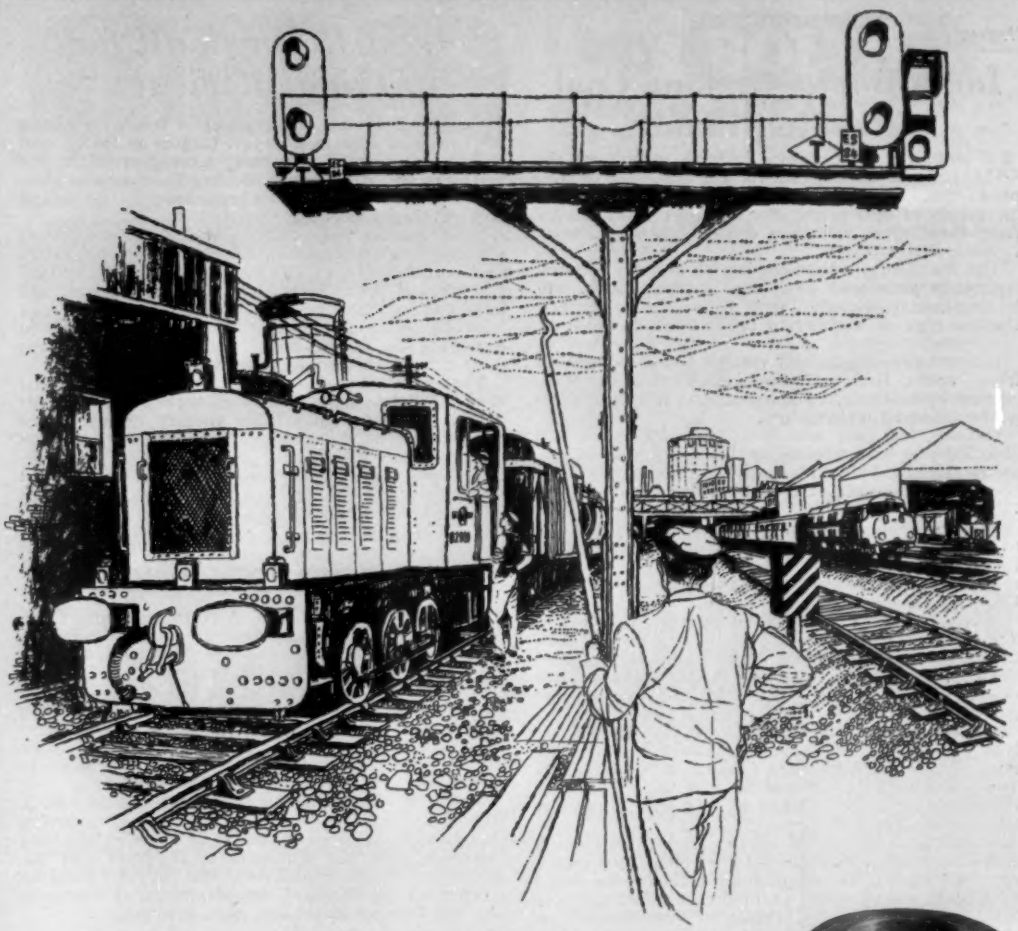
UK-USSR EXCHANGE OF TECHNICAL "KNOW-HOW"

PROGRESS in the establishment of a programme for the exchange of technical know-how between the UK and the USSR during 1960-61 is reported in the Board of Trade Journal. The Textile Machinery and Accessory Manufacturers' Association has been in direct contact with the Soviet authorities and arrangements for the exchange of experts on the design of spinning and twisting machines and shuttleless weaving machines are going ahead.

List of UK companies which are willing to exchange information on methods of production and equipment has been submitted to the USSR by the Federation of Wire Rope Manufacturers. They have asked the Russians to receive a team from Britain interested in the same field. Exchanges on chemical engineering projects and the design and manufacture of chemical plant are also being organized and the Russians would like exchanges on automation and production in engineering, manufacture of lifting and conveying equipment, and the manufacture of gas and anæsthetic equipment.

The State Scientific and Technical Committee is the central co-ordinating body in the USSR for such interchanges and companies and associations interested should write to: Director of East-West Contacts, Foreign Office, 7, Carlton Gardens, London, S.W.1.

THE London telephone number of the Gas Council has been changed to BELgravia 4321.



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Orders Placed

India Books Cyclone Coal Washing Plant

AS part of the programme in India to increase the supply of washed coal for the expansion of steel production, Hindustan Steel, Limited, has ordered the supply of coal preparation plant worth £1,500,000 from the Coppee Company (Great Britain), Limited, London, W.1.

The machinery, which consists of a heavy medium separation plant and a Cyclone washing plant, will be installed at Bhojudih, West Bengal. It is the first Cyclone type of washery to be installed in India.

ENGINES FOR 74 passenger vehicles have been ordered from Norris, Henty & Gardners, Limited, of Manchester, by Lancashire, Aldershot, and Wolverhampton public transport undertakings.

ORDERS for steel and metal products valued at £660,000 have been received by Lamet Trading, Limited, at the Leipzig Fair. Most of the orders were from East Germany, with the rest going to Communist China.

PNEUMATIC HANDLING and mixing equipment worth nearly £500,000 is to be installed by Baker Perkins, Limited, Peterborough, at the new polyolefines plant at Carrington, near Manchester, of the Shell Chemical Company, Limited.

CONTRACT WORTH £100,000 for a new lighthouse at Sombrero in the Virgin Islands Group of the West Indies has been won by Stone-Chance, Limited, of Crawley. The order includes the replacing of the existing tower and light and reconstruction work at the site.

CARGO MOTOR SHIP of 13,000 tons deadweight has been ordered by Hain Steamship, Limited, of London, from John Readhead & Sons, Limited, of South Shields. The vessel will be powered by a 6,900 b.h.p. Sulza diesel engine, to be supplied by Wallsend Slipway & Engineering, Limited.

MAJOR INSTALLATION of micro-straining units worth $500,000 (about £178,000), for the initial stages of a proposed 100,000,000-gallons-a-day plant for the Board of Waterworks, Denver, Colorado, has been received by Glenfield & Kennedy, Limited, of Kilmarnock (Ayrshire), through its subsidiary—Glenfield & Kennedy, Inc.

VANAJAN AUTOTEHDAS, of Finland, has ordered 500 A.E.C. type AVU 470 diesel engines, fitted with Simms fuel injection and electrical equipment, from A.E.C., Limited, of Southall (Middx). The order is valued at about £250,000 and it brings the total value of A.E.C. engines sold to Finland in recent years to well over £1,000,000.

CONTRACTS FROM Northern Rhodesia and India have been secured by two companies in the Metal Industries, Limited, group. Lancashire Dynamo, Limited, through its Central African company, has received an order for six 1,500 h.p. water-cooled, synchronous motors for driving main drainage pumps at the Bancroft Mine in Northern Rhodesia. The second order, secured by J. G. Statter & Company, Limited, is for an 11 kV metal-clad 350 mVA rupturing capacity switchboard for the Durgapur steelworks in India.

The death has occurred of Mr. TOM CARRINGTON, chairman and joint managing director of Tom Carrington & Company, Limited, threading tool manufacturers, etc., of West Bromwich (Staffs).

West Riding Call for Canal Revival

REVIVAL of the canal system in the West Riding of Yorkshire to transport cargoes including coal and fuel oil is urged in a survey accompanying the first review of the West Riding County Development Plan. Allied to this would be the expansion of the inland port of Goole, says the survey.

"The greater use of the inland waterway system would solve to some extent the traffic problems which, so far as the carriage in bulk of such cargoes as coal and fuel oil is concerned, now confront the road and rail transport undertakings," the survey comments. "In the West Riding it should be the policy to encourage the use of canals rather than other means of transport for carrying general cargoes."

The survey says that despite the links of the canal system with Goole, a substantial volume of traffic for the West Riding entered the country through other Humber ports. There were also many cargoes, particularly coal, whether for export or coastwise shipment, from South Yorkshire, which could go straight from colliery to ship by water and should be directed through Goole.

THOS. W. WARD ACQUISITION

ENTIRE share capital of Anchor Insulating Company, Limited, steam and refrigerating engineers, caulkers, etc., of London, S.E.18, has been acquired by Thos. W. Ward, Limited, engineers, of Sheffield. The business of Anchor Insulating Company is complementary to that of Dick's Asbestos & Insulating Company, Limited, of London, E.16, a member company of the Ward group. A close-working association will be developed between the two companies to further operations in the field of insulation.

Mr. F. W. Robinson, Mr. S. J. Dyal, and Mr. W. S. Isherwood, directors of Dick's Asbestos & Insulating Company, have joined the board of Anchor Insulating Company, with Mr. Robinson as chairman and Mr. Isherwood general manager. Mr. R. A. Fishlock remains on the board of Anchor Insulating Company and will be responsible for sales direction.

US Concern Acquires Interest in Mechans, Limited

SUBSTANTIAL interest in Mechans, Limited, constructional plateworkers, etc., of Glasgow, has been acquired by the Union Tank Car Company of Chicago from Horseley Bridge & Thos. Piggott, Limited, ironfounders, etc., of Tipton (Staffs). The ownership of Mechans will be shared by the two companies under the agreement, taking effect on April 1.

Mechans will operate as an independent enterprise with its present board, augmented by Mr. E. A. Locke, jnr., president of Union Tank Car. It is possible that the agreement will lead to jobs for about 700 more Glasgow workers.

NET TURNOVER of the Essen-based Krupp group rose last year by 6 per cent. over the previous year's total to some £300,000,000. Almost 20 per cent. of this came from foreign sales.

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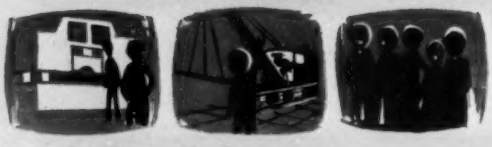

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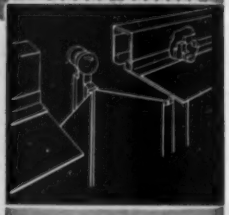

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Board Changes

Mr. D. McDonald Joins Bruce Peebles Board

CHIEF engineer of Bruce Peebles & Company, Limited, Edinburgh manufacturing engineers, Mr. Duncan McDonald has been appointed a director of the company. Mr. McDonald joined Bruce Peebles in 1954 as chief transformer designer and became chief engineer last year.

At Dunfermline High School, Mr. McDonald won the Gifford Memorial Prize for engineering and science before graduating in electrical engineering at Edinburgh University. After a three-year post-graduate apprenticeship with the British Thomson-Houston Company, Limited, Rugby, he joined the BTH transformer engineering department. In 1948, he was transferred to the research and development group of the transformer department and four years later was promoted head of the group. Mr. McDonald served as a member of the council of the Institution of Electrical Engineers from 1955 to 1958 and last year was appointed a member of its supply section committee.

Mr. C. Phillips, general works manager, has been appointed divisional director (works). Before joining Bruce Peebles in April last year, Mr. Phillips was employed by K&L Steelfounders & Engineers, Limited, Letchworth (Herts).

E. V. INDUSTRIALS, LIMITED—Mr. John K. Furse has been appointed to the board and Mr. Phillip N. Hoyle has resigned.

SKEFKO BALL BEARING COMPANY, LIMITED—Mr. Clause Folke Lindskog has been appointed an additional director.

FULLERS' EARTH UNION, LIMITED—Mr. H. L. Salter has been appointed a director of the company, a subsidiary of Laporte Industries, Limited.

WONTNER-SMITH, J. GRAY & COMPANY, LIMITED—Mr. David James has succeeded the late Mr. Ernest F. Bays as managing director of the company.

WARD & GOLDSTONE, LIMITED—Mr. F. E. Edmunds, a director of the subsidiary, Ward & Goldstone (Plastics), Limited, has been appointed to the board.

HACKBRIDGE HOLDINGS, LIMITED—Mr. D. W. Page has been appointed an additional director. He will act as financial controller and retain his appointment as secretary.

GILLETTE INDUSTRIES, LIMITED—Mr. Cecil F. Abderhalden, managing director, has joined the board and been elected vice-president of the Gillette Company, the American parent company. Sir Ernest Cooper and Mr. H. Gambrill, Jnr., have resigned from the board of the Gillette Company.

NEWAGE ENGINEERING COMPANY, LIMITED—Mr. A. D. MacKay has been appointed managing director of the group and has joined the boards of the subsidiary companies, Newage Machine Tools, Limited, Arthur Lyon & Company (Engineers), Limited, and H. E. Nunn & Company, Limited.

QUALCAST, LIMITED—Mr. A. J. Batterham, director and general manager of Qualcast (Wolverhampton), Limited, and Qualcast (Swan Gardens), Limited, and Mr. S. Webster, director and general manager of the Suffolk Iron Foundry (1920), Limited, have been appointed departmental directors of the company.

POWER-GAS CORPORATION, LIMITED—Mr. Cuthbert E. Wrangham, vice-chairman and managing director of the group, has succeeded Major W. R. Brown as chairman. Mr. Wrangham joined the board in 1952 and is a director of Ashmore, Benson, Pease & Company, Limited, P. G. Engineering, Limited, and Rose, Downs & Thompson, Limited, members of the Power-Gas Group.

EXPRESS LIFT COMPANY, LIMITED—Mr. W. J. Huggett and Mr. J. J. Gracie have resigned as directors. Mr. T. H. Kelsey, assistant general manager of the General Electric Company, Limited, Birmingham, has been appointed a director together with Mr. Michael J. Amberg, former southern area district manager, and Mr. R. A. Osborne, former maintenance and repair department manager.

Smokeless Fuel Plant Project for Swansea

EXPERIMENTAL processing plant for manufacturing a new type of patent smokeless fuel is to be built by the National Coal Board on the site of an old briquetting plant at the Graigola Works, Swansea. The fuel will be made by a new mild heat treatment process from anthracite and other smokeless coals mixed with grades of coal which do smoke.

No details of the new process have been released, but it is known that laboratory tests at the NCB research establishment at Stoke Orchard, Cheltenham, were successful. The task of translating laboratory techniques into commercial production falls on Dr. J. Bronowski, the board's director of process development, and his colleagues.

The plant will be developed under contract to the NCB by Humphreys & Glasgow, Limited, chemical engineers, of London, S.W.1. It is expected to take nearly a year to build.

More than 300 workers became redundant when the old Graigola Patent Fuel Works were closed 18 months ago. The NCB has another experimental patent fuel plant at Birch Coppice Colliery (Staffs), where an entirely different process is used.

Shorter Working Week for Engineering's "White-collar" Workers

SHORTER working week for about 500,000 "white-collar" workers in the engineering industry was agreed on Thursday of last week. In line with the settlement last month for manual workers, pay claims were rejected by the Engineering Employers' Federation and the four unions concerned were given a reduction in hours without loss of pay.

Staff workers in workshops and factories working 44 hours will have a reduction of two hours, those working 40 a reduction of one and a half, 39 a reduction of one, 38 a reduction of half an hour, and 37½ a reduction of 15 minutes. Employees working less than this will not be affected. The average working week at present is 39 hours.

SUBSIDIARY COMPANY is being formed in Holland by AEC, Limited, the sales organization of Associated Commercial Vehicles, Limited, makers of diesel-engined buses, coaches, and trucks. The subsidiary will sell vehicles, diesel engines, and spare parts in Holland as well as providing vehicle maintenance and repair facilities.